JUNE 1954

FOUNDRY

...WHEREVER METALS ARE CAST

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Nonferrous Test Bars—p. 96
Cutting Refractory Costs—p. 106
Solidification of Gray Iron—p. 108
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FOR BETTER MELTING... CLEANER IRON—*PURITE*

1. Purite produces higher percentages of finished castings per ton of metal poured.
2. Purite gives 100% fluxing action in the cupola—100% desulphurizing action in the ladle.
3. Purite is time-tested and proved for unsurpassed desulphurizing uniformity.
4. Purite is 100% pure fused soda ash—you do not pay for inert materials.
5. Purite gets to all the iron quicker.
6. Purite comes in uniform 2-lb. pigs—no weighing or measuring required.
7. Purite does not crumble—is easy to handle—no waste, no dust.
8. Purite can be shipped in bulk carloads at substantial savings over bag shipments—is easily stored without deterioration.

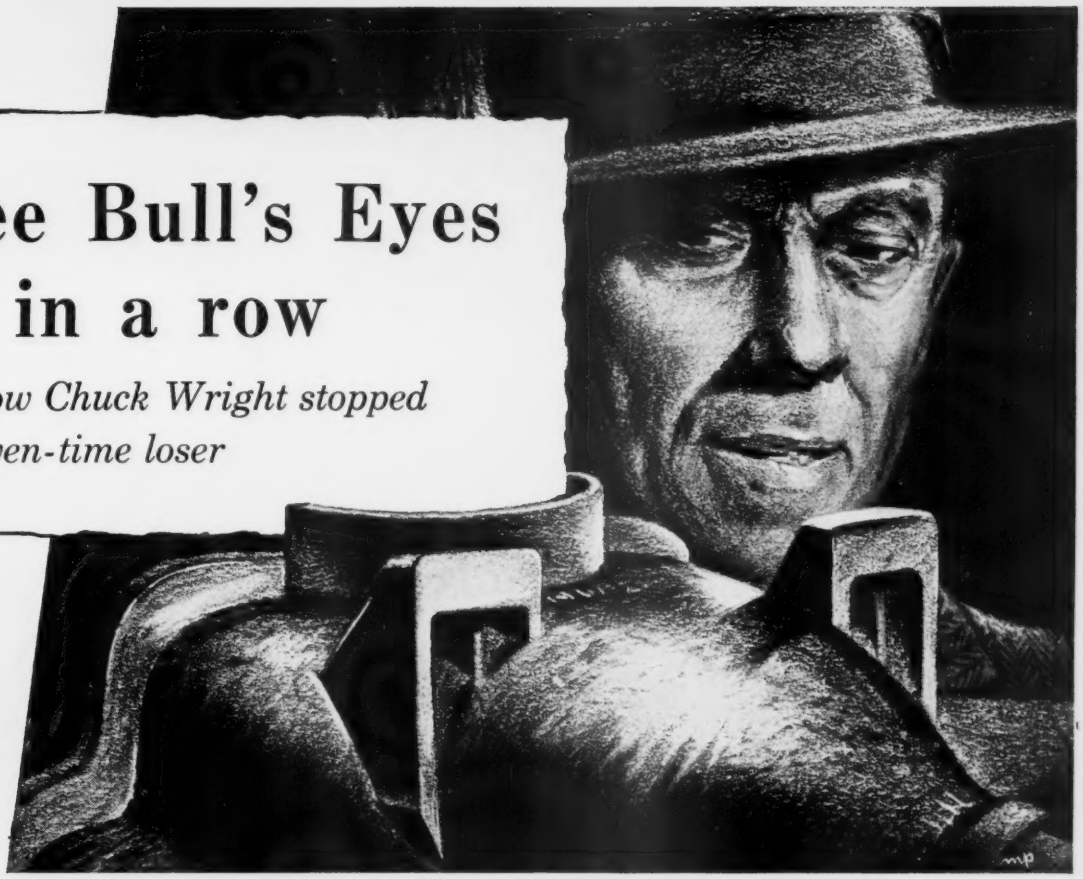
Purite, the scientific flux, is sold by leading foundry supply houses in the United States and Canada.

MATHIESON

MATHIESON CHEMICAL CORPORATION
Mathieson Industrial Chemicals Division
Baltimore 3, Maryland

Three Bull's Eyes in a row

...or how Chuck Wright stopped a seven-time loser



"Milmax was in trouble. Bad trouble..."

That's the way the Inco distributor foundry specialist, Chuck Wright, started talking about the Milmax Foundry & Machine Company.

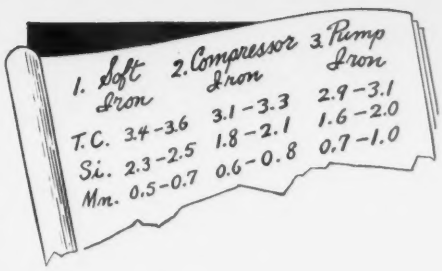
"When I arrived in the district, word reached me that Milmax wanted to see me. Their costs for castings were much too high. So I went down and talked to Clem Morgan, their foundry superintendent.

"His big problem was to produce pressure tight, machinable castings that varied from small compressor units for home air conditioners to pump casings weighing 5 tons.

"Because of this wide variety, Milmax decided to use seven different cupola mixes. As high as five were poured off from just one cupola in one day. Think of the control problem! How the idea of seven cupola mixes got by the Milmax brains department is one of the things I'll die wondering about.

"Everybody was milling around Clem's desk. I really felt sorry for the guy.

"Getting him to one side, I marked his notebook like this...



"Take any single one of these base compositions and you can get three different types of iron by treating it with suitable additions of nickel plus chromium or molybdenum. Clem was mighty glad to learn three base compositions... with alloy additions... could answer all his needs.

"He uses No. 1 for light section work, adding 0.75 to 1% nickel for tightness and machinability in pressure castings.

"His big tonnage iron, No. 2, is brought down through the cupola with 0.75 to 1% nickel, to reduce the amount of alloy additions to the ladle. Practically all is poured with silicon inoculation. You know, the greater the pressure requirements the greater the need for nickel. Clem increases nickel up to 2% maximum. And for density in sections close to 2", he adds 0.25 to 0.40% chromium.

"No. 3, the pump iron, he brings down with 1.0 to 1.25% nickel to reduce ladle additions. But in all cases it's inoculated with 0.25 to 0.40% silicon, because pumps face high pressures that call for heavy sections in flanges and in other critical areas.

"For higher pressure needs, Clem raises the nickel to 1.75%. For castings with the heaviest sections, he uses additions to the base iron of 0.25 to 0.50% Cr and 0.20 to 0.40% Mo, with nickel at 1.5 to 1.75%. By raising the nickel of the base iron to about 2.5% and adding 0.6 to 1% Mo, plus ladle inoculation of 0.5% Si, he makes a high test gray iron of 60,000 psi. minimum.

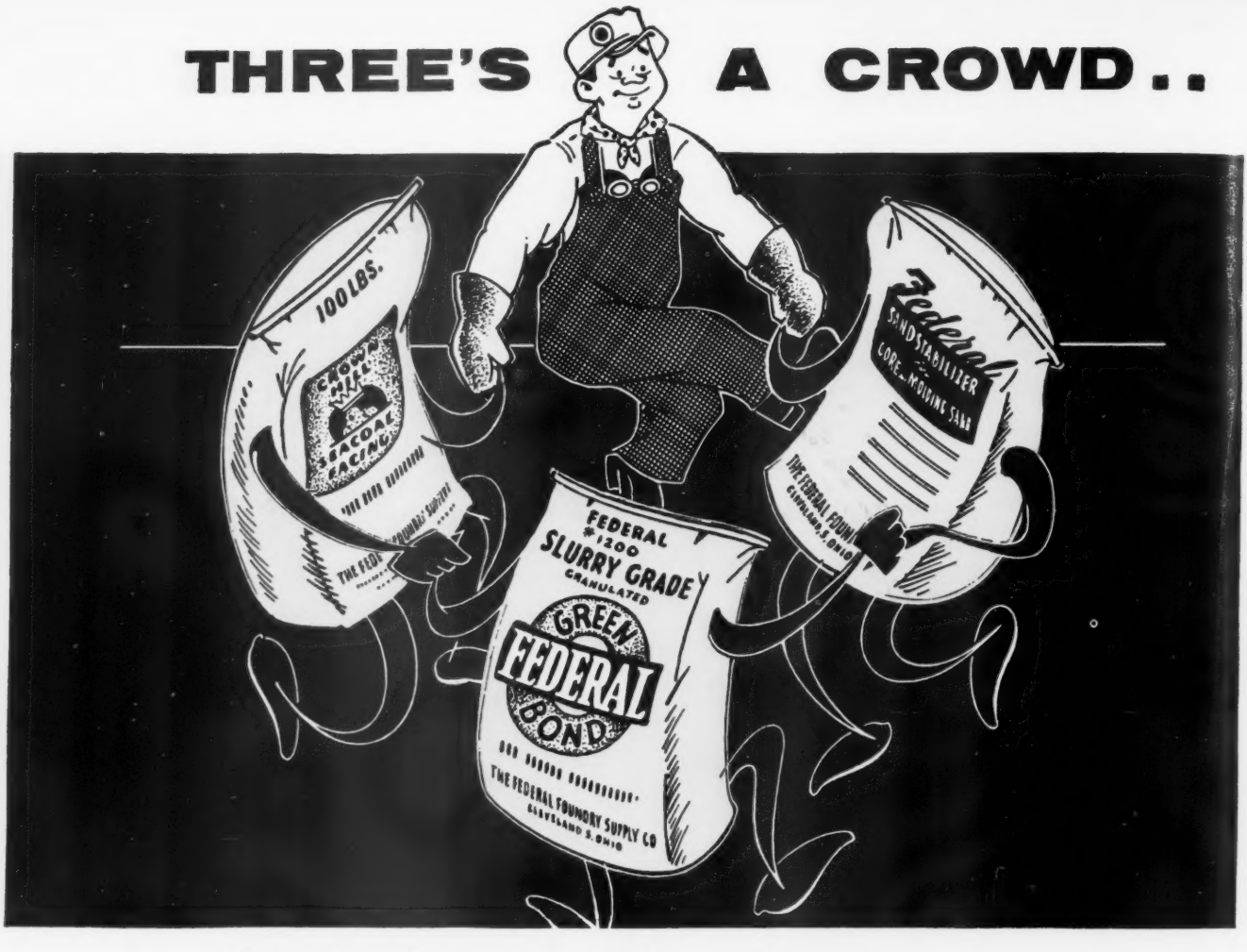
"It's surprising how many foundry troubles can be eliminated through the use of nickel. Whenever you face a casting problem, just drop me a line. I'll be happy to give you some practical help."

Chuck Wright

The International Nickel Company, Inc.

67 Wall Street New York 5, N. Y.

THREE'S A CROWD..



. . . but in this case, three sand additives make a perfect slurry!

A well known production foundry recently sought means to improve their molding sand slurry mixtures. After exhaustive tests, using every possible type of sand additive, they found that a combination of three particular additives gives them excellent control of all vital sand characteristics—with much less strain on their pumping system and pipe lines.

As a base for their slurry, this foundry uses #1200 Slurry Grade, Granulated, Federal GREEN BOND Bentonite. This top quality, western bentonite goes into slurry *quickly*. Its medium viscosity in solution, plus its exceptionally high strength, makes possible the addition of exactly the right amount of bentonite to the slurry for maintenance of desired green strength. Up to 2% more Slurry Grade, Granulated GREEN BOND can be added without straining the pumping system.

The addition of Federal SAND STABILIZER and Federal CROWN HILL Seacoal to the bentonite slurry provides the necessary flowability and carbon content—resulting in more uniform mold hardness and better shakeout conditions. Furthermore, the Federal SAND STABILIZER *sharply reduces the viscosity of the slurry*, without decreasing green strength. This makes it possible to *increase* the percentage of Granulated GREEN BOND Bentonite added to the slurry—producing a more highly concentrated strength per gallon of slurry—with *less strain* on the pumping system and *no clogging* of pipe lines.

If you use the slurry system of sand bonding in your foundry, you'll want to learn more about these efficient Federal slurry additives. We'll gladly consult with you about them, or send complete information.

FEDERAL

Make your foundry a better place in which to work!

The **FEDERAL FOUNDRY SUPPLY** *Company*

4600 EAST 71st STREET, CLEVELAND 5, OHIO

CROWN HILL W. VA. • CHICAGO • DETROIT • MILWAUKEE • RICHMOND VA. • ST. LOUIS • CHATTANOOGA • NEW YORK • UPTON, WYO.

IN TWIN CITIES, C. D. Gallaher Company, 426 Stinson Blvd., Minneapolis

FOUNDRY

June 1954

Volume 82—Number 6

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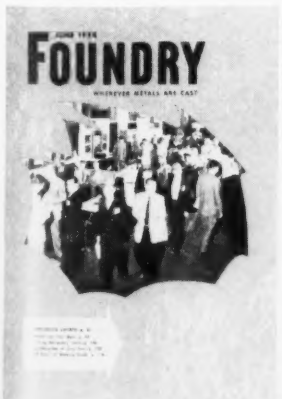

THE COVER: The products of over 300 exhibitors were shown to about 15,000 visitors at the 58th AFS Congress and Exhibit held in Cleveland. See p. 86

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Gigantic casting by Lynchburg Foundry

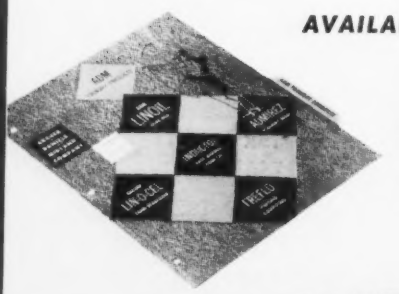
Moving out of Radford, Va., on its way to Baldwin-Lima-Hamilton Corporation is one of the largest castings in current production at the Radford Plant of the famous Lynchburg Foundry Company.

Weighing 26 tons and measuring 9 ft. x 6½ ft. x 17 ft., this block of cast iron will go into service as an upright for a huge press.

The cores used in producing this casting tip the scales at 35 tons! When you estimate the time, manpower, and materials involved, you can imagine the responsibility placed upon the core department.

Lynchburg Foundry, whose skill is universally recognized, has found that LINOIL is good insurance against faulty cores. Rigid quality control keeps LINOIL uniform, shipment after shipment.

Why not call your ADM Representative today – ask him to ship a trial drum of LINOIL to your plant.

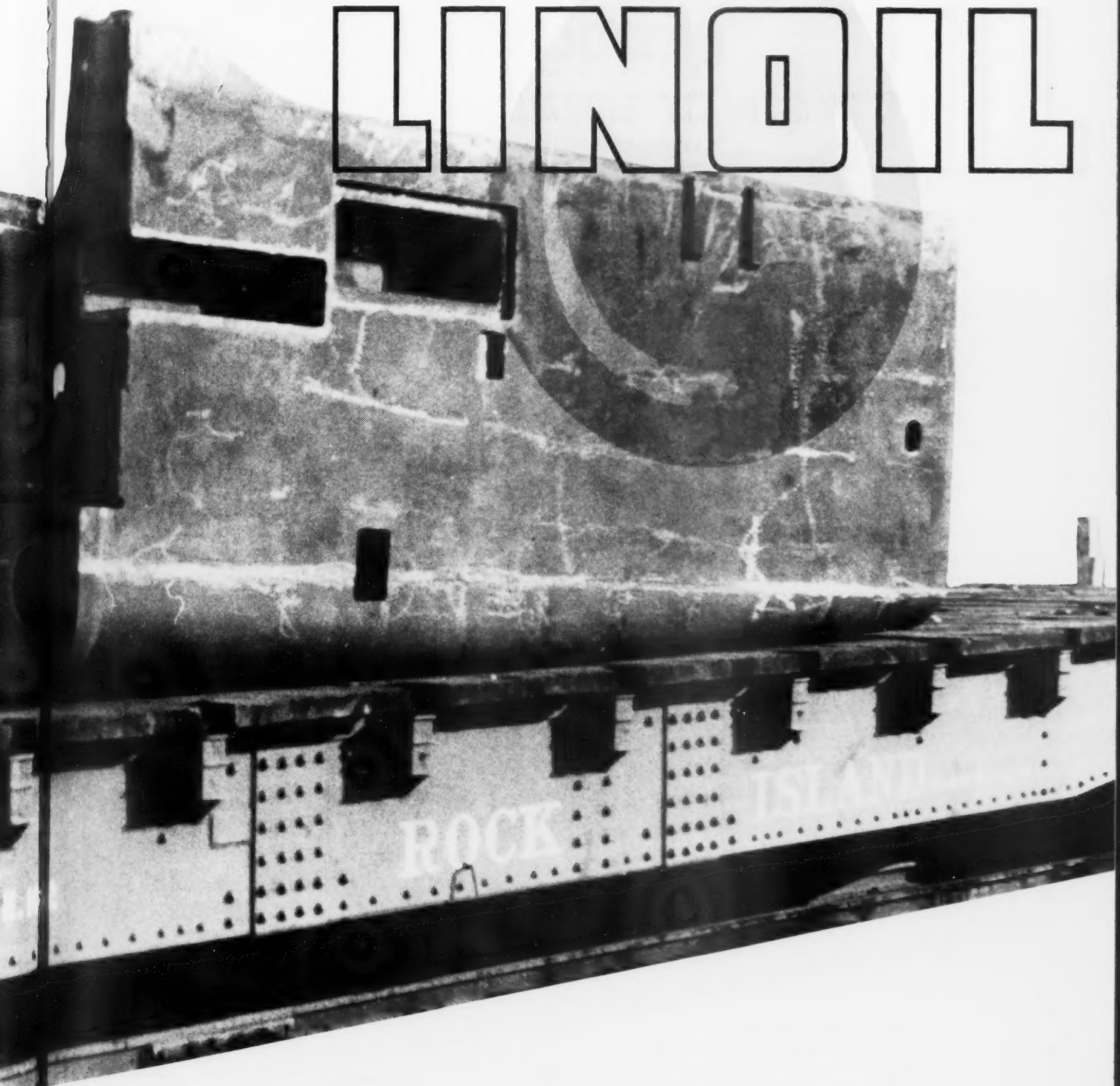


AVAILABLE TO FOUNDRIES...

continuous Technical Information Service on the latest developments from the ADM Sand Laboratory. Furnished in handy file folder form for quick reference. A request on your letterhead will put your name on our Technical Information mailing list.

ry Co. takes 118 gallons of

LINOIL



ARCHER • DANIELS • MIDLAND COMPANY

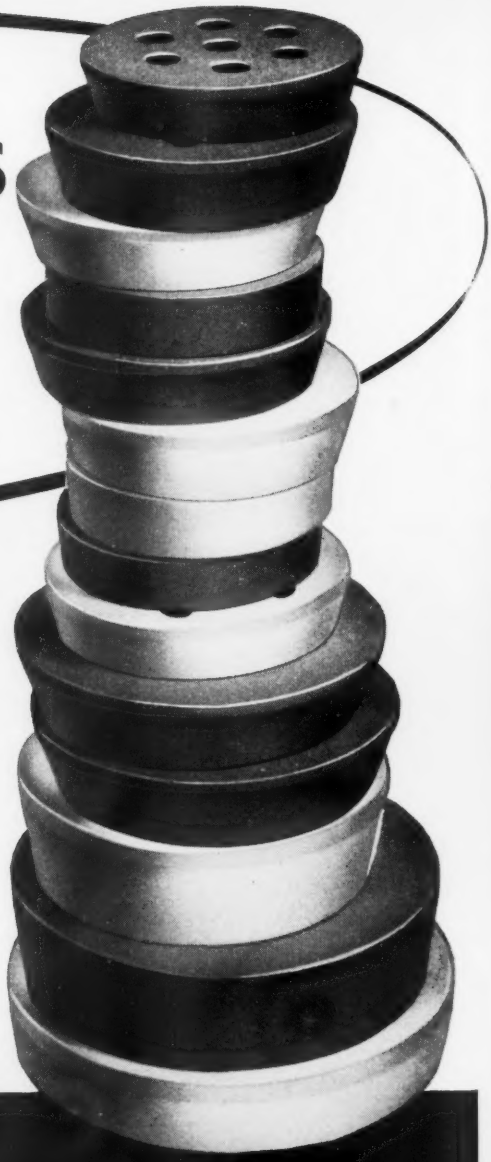
FOUNDRY PRODUCTS DIVISION • 2191 WEST 110TH STREET • CLEVELAND 2, OHIO

producers of

14 STANDARD SIZES IN STOCK

FOR IMMEDIATE SHIPMENT

AlSiMag® Ceramic STRAINER CORES



2 SPECIAL COMPOSITIONS

AlSiMag 564 (White)
Economical, withstands pouring temperatures of iron, aluminum, bronze, brass, and similar metals.

AlSiMag 202 (Tan)
Special heat shock resistance. Excellent for all metals with exceptionally high pouring temperatures.

WRITE FOR FREE BULLETIN 532
for details on AlSiMag Strainer Cores—standard sizes and custom designs—and AlSiMag Cut-off Cores, Troughs, and Gate Tubes.

TEST THEM IN YOUR OWN FOUNDRY
Samples of standard sizes free on request. Samples made to your own specifications at reasonable cost.

MORE ECONOMICAL THAN SHOP-MADE SAND CORES

- Resistant to heat shock
- No erosion at any normal pouring temperature
- Non-spalling
- Completely free of gas
- Not affected by moisture
- Strong, will stand the roughest handling
- Do not contaminate scrap
- Flat and uniform

WRITE DEPT.-D

AMERICAN LAVA CORPORATION

A SUBSIDIARY OF MINNESOTA MINING AND MANUFACTURING COMPANY

CHATTANOOGA 5, TENNESSEE

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52nd YEAR OF CERAMIC LEADERSHIP

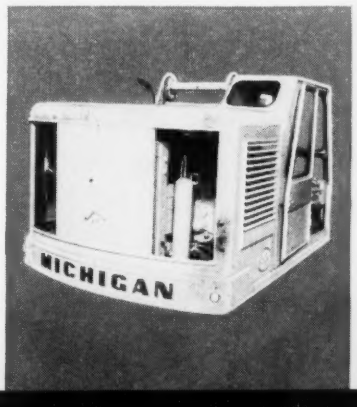
FULL VISION means you'll Move More with a MICHIGAN

Step into a MICHIGAN* cab, and sit in the operator's comfortable seat. Notice how easy it is to follow every move on the job. 3604 square inches of glass!—see what excellent vision is provided, in all directions and overhead.

Here, indeed, is a masterpiece of smart modern design: a truly functional cab—fully ventilated, quiet; a comfortable cab designed to make the operator's job as easy as possible. Look, also, at the outside of the cab; at the adjustable louvers on both sides for good ventilation; the sliding rear doors that make it easy to get at the engine; the rear window to complete the full-vision facility.

For an easy point-for-point comparison of the MICHIGAN with other machines, send for the MICHIGAN Fact Folio: contains full information, including an interesting book "More Yardage Through Air Power." The coupon gets prompt action.

**A Trademark of Clark Equipment Company*



CLARK EQUIPMENT

CLARK EQUIPMENT COMPANY
Construction Machinery Division
442 Second Street, Benton Harbor, Michigan

Please send the MICHIGAN "24" Fact Folio

Name_____ Title_____

Firm_____

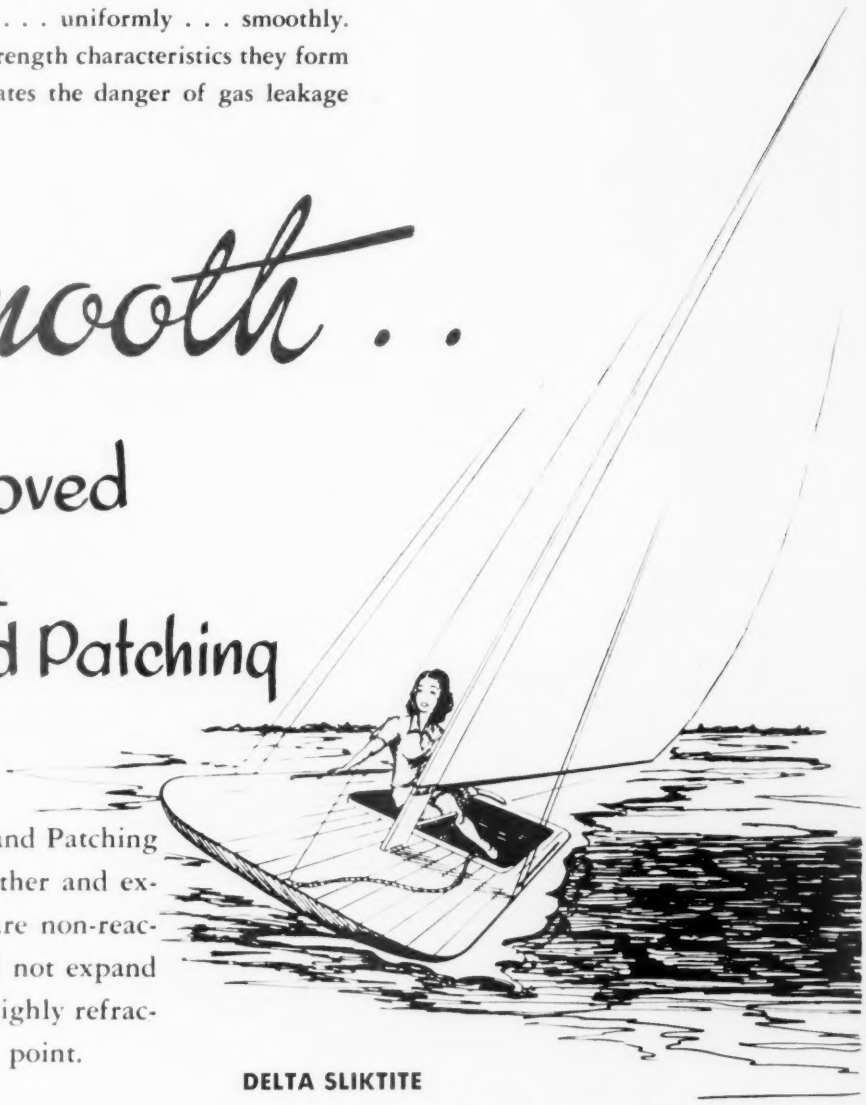
Address_____

City_____ County_____ State_____

Delta Mudding and Patching Compounds are used to eliminate fins at core joints and to repair core imperfections. They are easy to apply . . . quickly . . . uniformly . . . smoothly. Due to their high hot and dry strength characteristics they form a complete bond which eliminates the danger of gas leakage at core joints.

Smooth . .

New...Improved DELTA Mudding and Patching Compounds



The new DELTA Mudding and Patching Compounds are faster, smoother and extremely easy to use. They are non-reactive with molten metal, will not expand or contract when dried, are highly refractory and have a high fusion point.

DELTA SLIKTITE

is a clean, smooth, ready to use plastic-type Mudding and Patching Compound for use on cores in the production of steel, gray iron, malleable and non-ferrous castings.

DELTA EBONY

is a smooth, black, ready to use plastic-type Mudding and Patching Compound for use on cores in the production of gray iron, malleable and non-ferrous castings.

Ask for working samples of the new, improved Delta Mudding and Patching Compounds. Be sure to specify SLIKTITE or EBONY. You will also receive complete instructions for use.

DELTA

DELTA OIL PRODUCTS CO.

MANUFACTURERS OF SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

MILWAUKEE 9, WISCONSIN

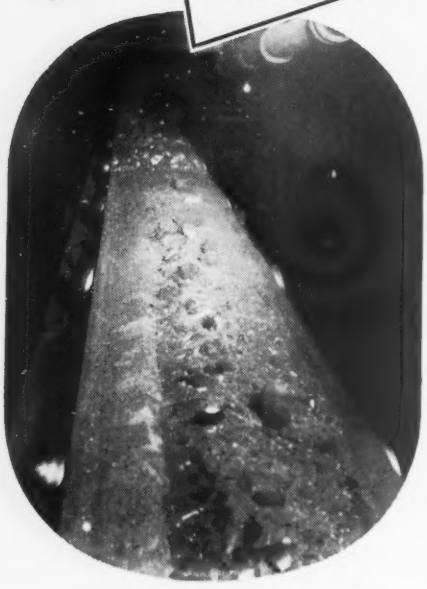
Chicago Pneumatic

8 East 44th Street, New York 17, N.Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

"Imperial Belting 3 to 1 better"

says foundry foreman



Less ripping... better heat resistance

Two Imperial Insulated Sahara Belts installed recently at the Duriron Co., Inc., Dayton, Ohio, are giving 3 to 1 better performance than previous belts used, reports S. W. Jamison, General Maintenance Foreman. One of these belts (126′ x 20″ x 6 ply) is shown above on a tunnel shakeout. Ripping damage from sharp iron and gaggers in the hot shakeout sand has been practically eliminated. Heat resistance of the Imperial Belts also is greater, Mr. Jamison notes.

Job-designed for long service

These improved performance qualities result from Imperial's tough construction of heavy-duty silver duck, double-stitched plies, and special impregnation and insulation.

Imperial Belts, job designed for specific operating conditions, can do a better job for you, at less cost. Write today for Data Sheet 54-2.

Imperial
BELTING CO.
1755 S. Kilbourn Ave., Chicago 23, Ill.
You expect more from Imperial ...and you get more

WITH THE EDITORS

A GOOD SHOW: The convention is over, the show is being dismantled, and most of the visitors have left for home. Once again the foundrymen of Cleveland are settling back to normal living. But it surely was a strenuous week!

Talking with many exhibitors during the final hours on Friday, I found them pleased with the show, the attendance, interest shown, and the possibility of translating that interest into future sales. The consensus indicated it was a good show.

—o—

Vaudeville Returns: Special congratulations to all who planned the annual banquet, the outstanding social function of the convention. The presentation of the medals was well handled. The entertainment program was excellent, and Will Mahoney took us back to the days of wonderful vaudeville at the Palace in Cleveland and the Majestic in Chicago. Cleveland's contribution to the program, the Hermit Singers, under J. E. Hines, proved to be a very fine musical organization.

—o—

Tearing Down: For months and months the exhibit manager labors long and hard to build a show that will satisfy the exhibitors and please the thousands of customers that attend. Then, within a few minutes after the closing hour, much of it is torn down and on its way. Ed Hoyt never watched the tearing down of his "baby" and I did not see Al Hilbron around at all at 1 p.m. Friday.

—o—

Moving Fast: Speaking of tearing down, work on dismantling the FOUNDRY booth started immediately after the closing at 1 p.m. on Friday. The booth was in a van at 3:30 and arrived at Chicago at noon on Saturday. It was set up at the Basic Material Show there on Sunday, and was all ready to serve Penton friends when that affair opened Monday.

—o—

The Centenarian: Congratulations to Roots-Connersville Blower Division of Dresser Industries Inc., Connersville, Ind., on its 100th anniversary. Organized a century ago to manufacture equipment for moving gas and air, the company now stresses the point that this still is its only business. While FOUNDRY (in its 62nd year) is just a youngster compared with the Roots-Connersville organization, the two organizations have been partners in promoting blowers to the foundry industry for many years. The first Roots-Connersville advertisement appeared in the 12th issue of FOUNDRY, published in August 1893, and the sales messages of that organization have appeared in most issues since. The most recent advertisement was on page 390 of the May issue.

—o—

We Came Apart: For a number of years, FOUNDRY has used a special method of binding which permitted the publication to lie flat when open. Briefly, this method consisted of wire stapling each section (or signature), assembling them and gluing the edges to the backbone of the paper cover. Variations in materials and rough usage frequently caused sections to come apart, so that the decision recently was made to start side stapling with the May issue. Evidently we waited one month too long to take this step, because we had numerous complaints from readers that parts of the April issue "fell apart." A check in the bindery shows both glue and process to be the same, but evidently the resultant product was not. We are sorry.

Our best letter of complaint came from P. J. Potter, vice president, Pangborn Corp., Hagerstown, Md., and well known to so many foundrymen. P. J. writes as follows:

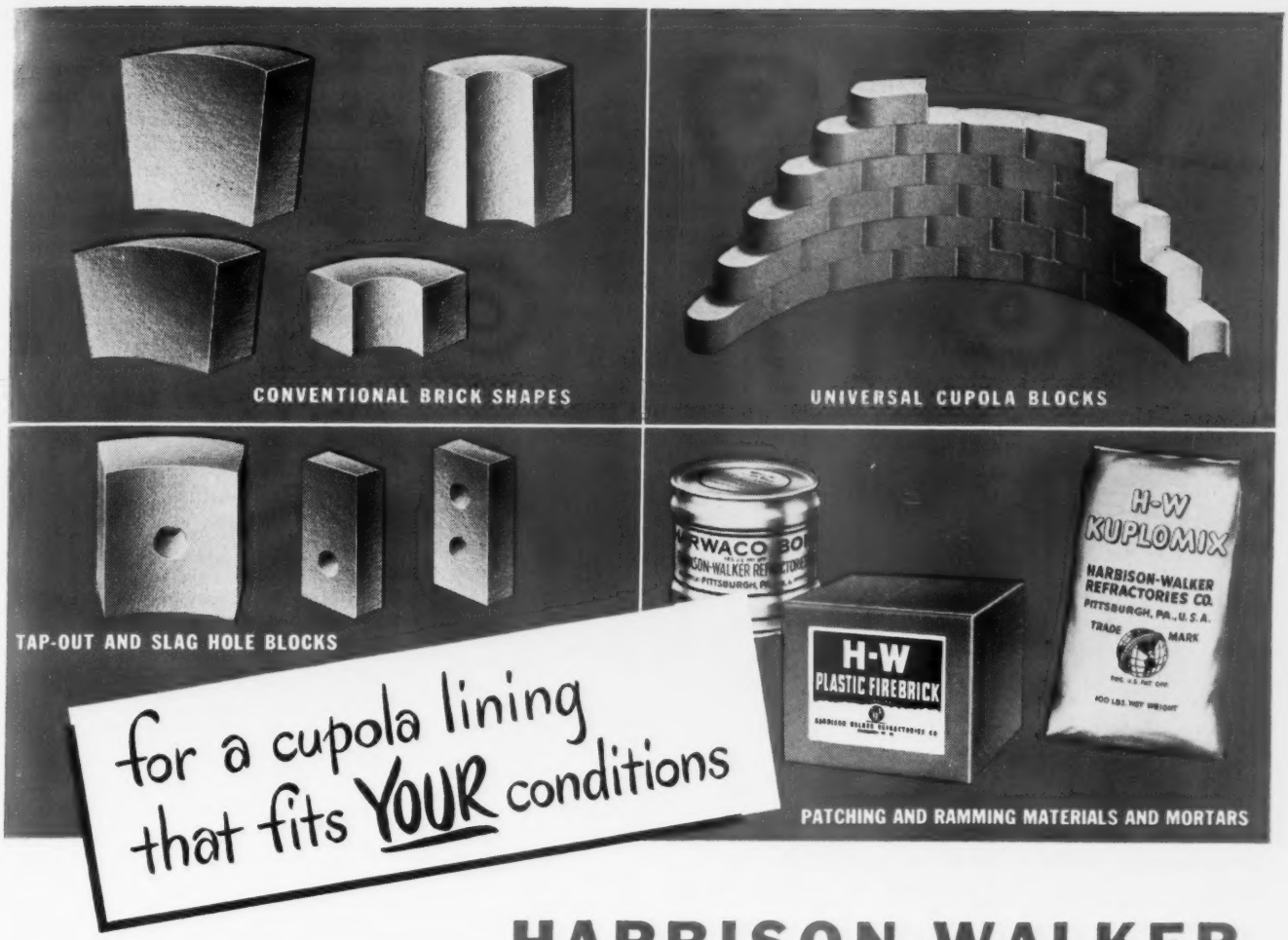
The April issue of FOUNDRY (company subscription), reached my desk this morning. It was completely disorganized. Pages 1 to 32 had fallen out, so had pages 35 to 66, also pages 201 to 232. The magazine passes through several hands before reaching me. I complained of their rough handling. However, when I tried to read my home copy, it literally fell apart in my hands. As the late-lamented Pat Dwyer would put it—

At evening's ease with my copy of FOUNDRY,
The reading's quite good but the binding confounds me.
You open the book, the pages all scatter
On table or floor; great grief, what's the matter!
You pick up the pages, replace them with care,
Again they fall out; it gets in your hair!
To the editor write, he answers all questions.
Let's read his excuses, what reasons he mentions.

—o—

The IBF Is Fifty: Our sincere congratulations to the Institute of British Foundrymen in completing fifty years of service to the foundry industry of Great Britain. In marking the completion of the first half century, the institute has published a special booklet containing an excellent history of the organization by Tom Makemson, who has served with distinction as secretary of the institute since 1926. The history also is presented in the Apr. 8, 1954 issue of the *Foundry Trade Journal*, the official organ of the institute.

(*Concluded on page* 12)



HARBISON-WALKER
cupola refractories

Many factors and operating variables, such as the nature of the charge, method of charging, character of the flux and fuel, blast velocity, duration of heat, tapping temperature and continuity of operation influence the lining life.

For best economy, you may need a cupola lining having certain predominant physical and chemical properties. Harbison-Walker offers the complete line of cupola refractories, whether the requirement may demand one which is highly siliceous or highly aluminous, of maximum density or of highest spalling resistance.

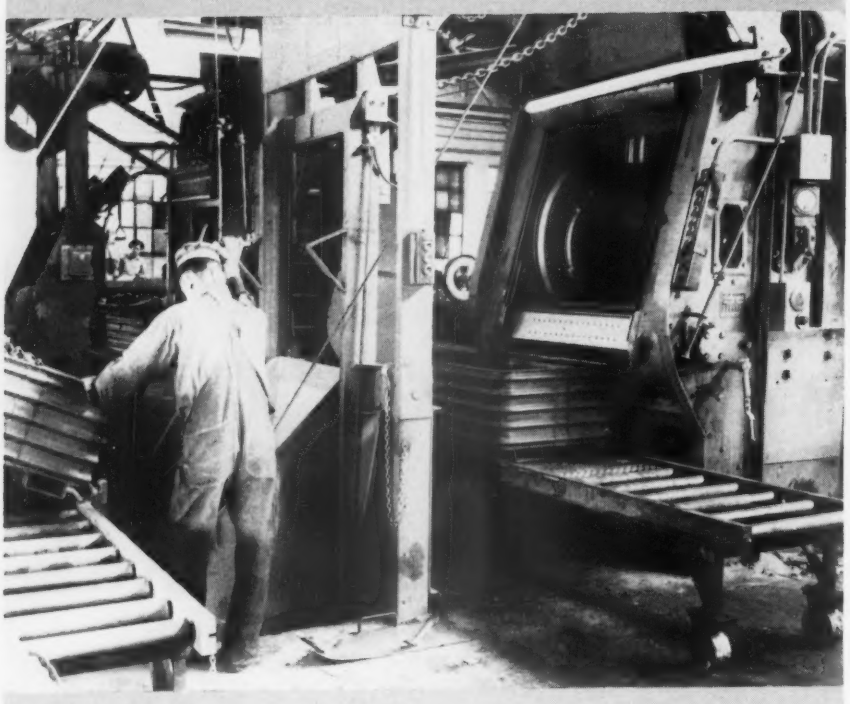
Harbison-Walker products include refractories of various types and of widely differing properties for all general foundry requirements. For greatest overall economy and continuity of service, use Harbison-Walker refractories.

HARBISON-WALKER REFRACTORIES COMPANY

AND SUBSIDIARIES *World's Largest Producer of Refractories*

GENERAL OFFICES · PITTSBURGH 22, PA.

for real tough
foundry service
you can't beat...
MATHEWS CONVEYERS



Mathews heavy-duty roller conveyers are designed for rugged foundry work. They are the result of nearly 50 years of experience in the handling of molds and castings — under all conditions — in every type of foundry. Call in your nearby representative. Have him show you how Mathews Conveyers might help you improve your materials handling.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

MATHEWS CONVEYERS
GENERAL OFFICES . . . *Mathews Conveyer Company*
ELLWOOD CITY, PENNSYLVANIA
PACIFIC COAST DIVISION . *Mathews Conveyer Company West Coast*
SAN CARLOS, CALIFORNIA
CANADIAN DIVISION . . . *Mathews Conveyer Company, Ltd.*
PORT HOPE, ONTARIO
Engineering Offices or Sales Agencies in Principal American and Canadian Cities

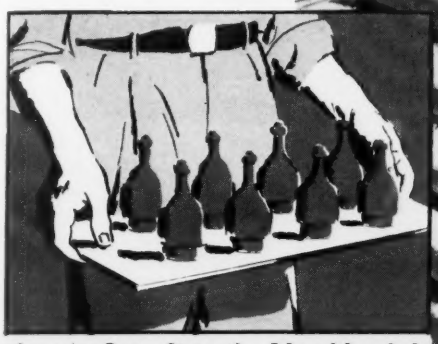
(*Concluded from page* 10)

Many in the United States will find much of interest in Mr. Makemson's recital of progress. Numerous names and events are quite familiar. I was particularly interested in the section devoted to "International Relations." Pointing out that "few industries are more internationally-minded than the foundry industry," Mr. Makemson stated: "International relations seems to have commenced with a visit to this country in 1918 by Mr. H. Cole Estep of the Penton Publishing Co. of Cleveland, Ohio, publishers of FOUNDRY. Visits soon followed from Mr. A. O. Backert of the same company, (at that time editor of FOUNDRY) and later by Mr. John Penton, its president, and it was Mr. Backert who suggested the system of annual exchange papers between the British and American Associations, which has been so successful and which has been extended to other countries."

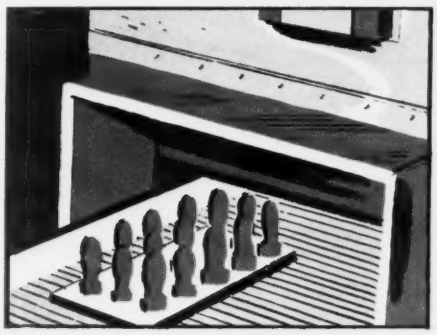
FOUNDRY is proud of the contributions of its staff members to the field of international relations in the foundry industry. In addition to the events recorded by Mr. Makemson, it might be mentioned that H. Cole Estep headed the Penton Publishing Co. Ltd. in London from the close of the war until 1924, and during that time did much to develop the exchange of information between Britain and the United States. When he returned to the United States in 1924, Vincent Delport became head of the Penton organization in London and European manager of FOUNDRY. For the past 30 years he has ably represented the American Foundrymen's Society on the International Committee of Foundry Technical Associations, attending practically all of the International Foundry Congresses held during that period, including the Detroit Congress in 1926 and the Atlantic City Congress in 1952. Mr. Delport also attended the AFS convention and exhibition in Cleveland in 1946.

In 1929, Mr. Estep, then vice president of the Penton Publishing Co., and Dan M. Avey, editor of FOUNDRY and chairman of the International Relations Committee of AFS, were in the American party that attended the first International Foundry Congress, which was organized by the institute and held in London. For a number of years I also was privileged to serve as chairman of the International Relations Committee.

I often think that if men in the governments of nations could be as willing to provide co-operative understanding as are the foundrymen of so many countries, many of today's world problems would fade away. F.G.S.

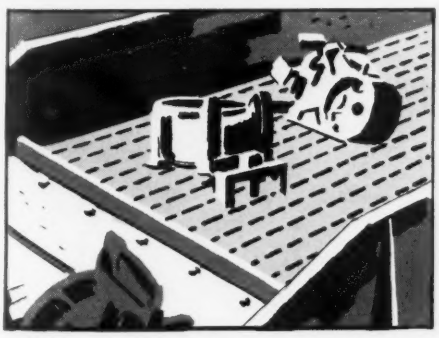


Superior Green Strength... Mogul-bonded cores maintain shape and dimension throughout handling and storage.



Quick Drying . . . This property cuts down oven time, thus increasing oven capacity.

Excellent Permeability . . . You reduce costly "blows" and casting loses due to inadequate venting.



Adequate Collapsibility . . . Mogul burns out at just the proper instant, eliminating strains and hot-tears.

Why MOGUL® is the preferred cereal binder

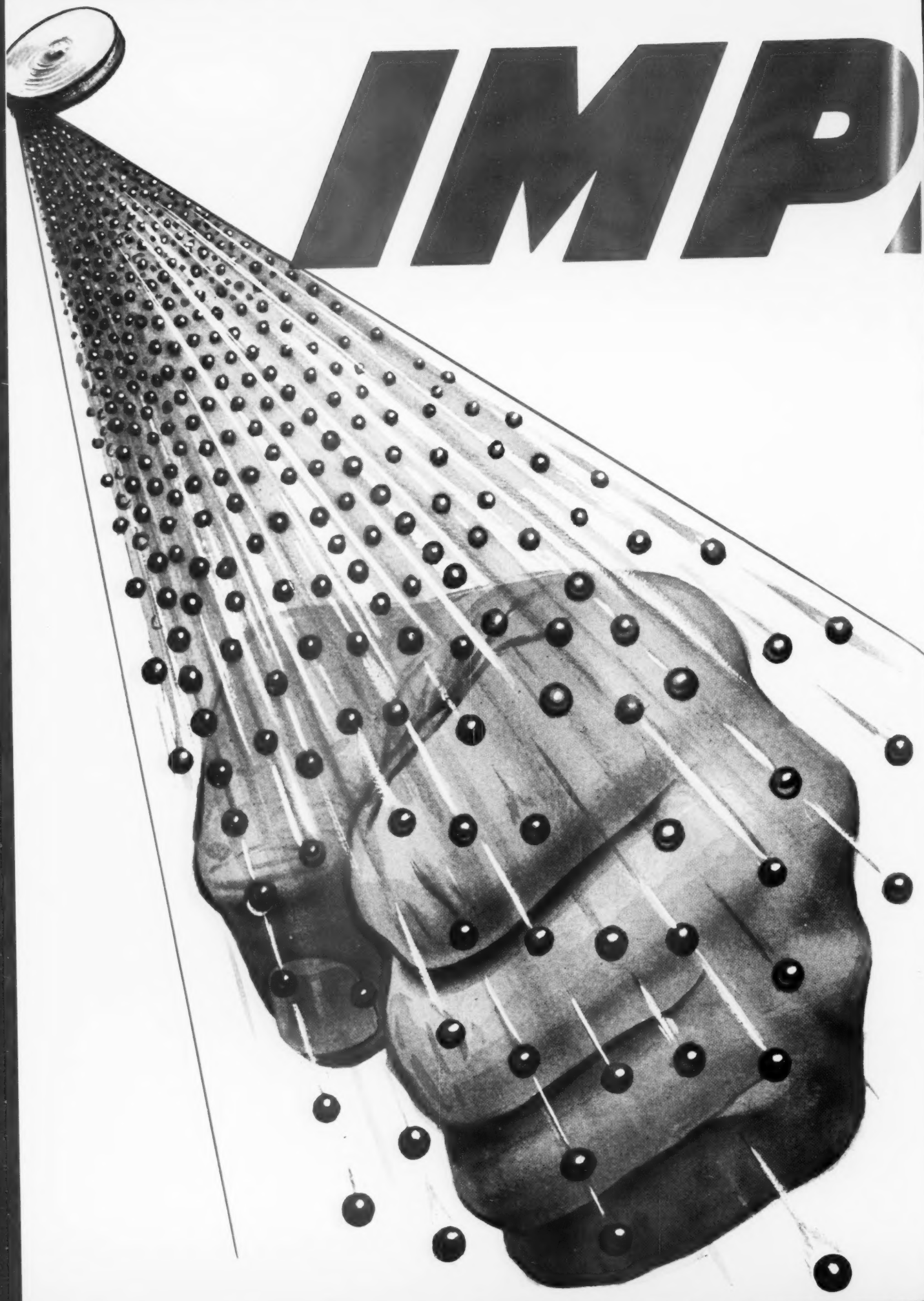
Performance-proved, Mogul Cereal Binder will save you money. Being a uniform product, Mogul Binder helps you standardize core mixtures. The short-baking time required by this binder gives you greater oven capacity. Mogul is available in bulk for use with automatic unloading and handling machinery.

Cores made with Mogul produce castings with a finer finish and exceedingly true pattern reproduction.

Our new research foundry laboratory assures product uniformity and performance. Our technical staff welcomes an opportunity to help you solve production problems. No cost or obligation.

CORN PRODUCTS REFINING COMPANY

17 Battery Place, New York 4, New York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PACT!

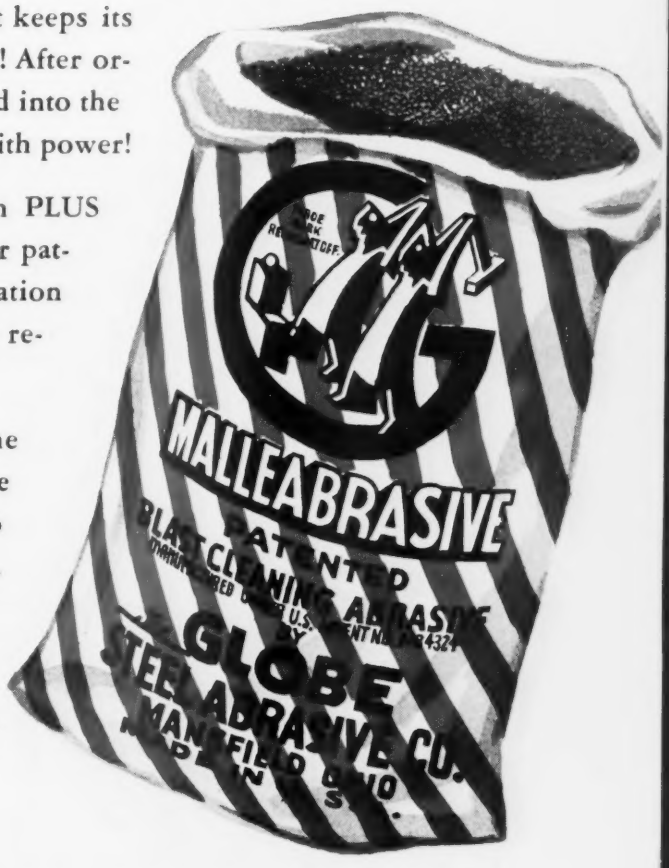
Malleabrasive Shot and Grit is packed with IMPACT cleaning power for lower cost operation!

Why is Malleabrasive packed with power? Because it keeps its *punch* longer . . . retains its original grain size longer! After ordinary abrasives have shattered into "fines" and passed into the dust collector, Malleabrasive *still* stays young—alive with power!

Malleabrasive has all the toughness of malleable iron PLUS peculiar hardness characteristics provided only by our patented Malleabrasive process. This amazing combination results in fast cleaning combined with tremendous reduction in wear on machine parts.

That's why foundrymen agree that Malleabrasive is the iron fist for cleaning, but the velvet glove for machine parts wear. No "fines" here to chew machine parts to bits! Malleabrasive *wears* down . . . never shatters . . . continues punching to the end!

Get the full story about Malleabrasive. Write THE GLOBE STEEL ABRASIVE CO., Mansfield, Ohio.



"If you use metal abrasive, you should use Malleabrasive."

MALLEABRASIVE ®

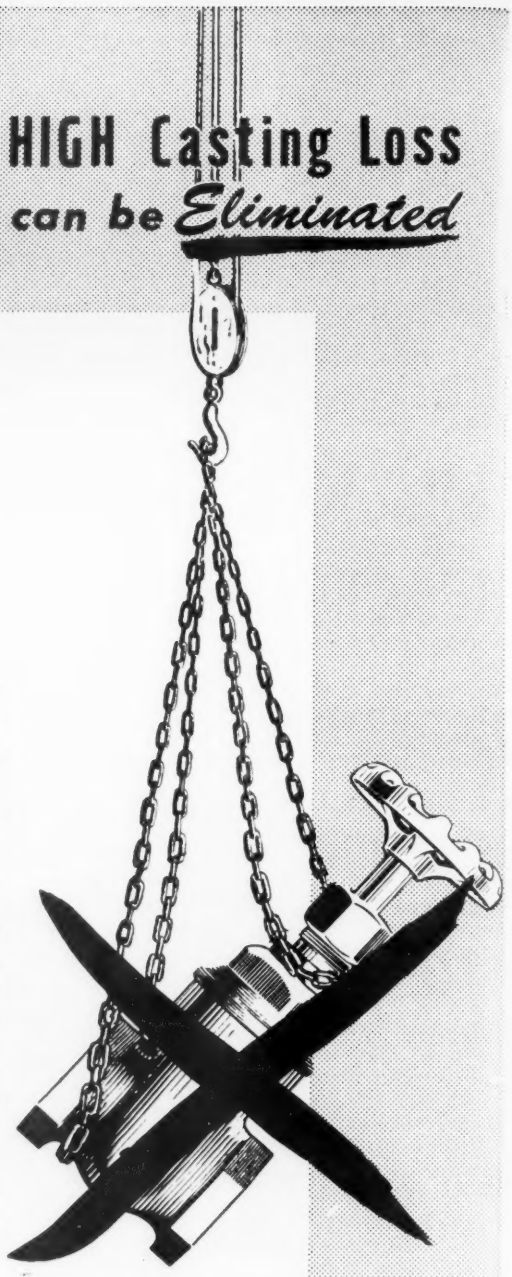
U.S. Patent 2184926 (others pending)

Made by THE GLOBE STEEL ABRASIVE CO., MANSFIELD, OHIO

World's largest manufacturers of Malleablized Shot and Grit • Established 1907

THERE IS A SOLUTION TO YOUR NONFERROUS *Foundry Problems...*

HIGH Casting Loss *can be Eliminated*



When you call upon LAVIN'S ENGINEERING SERVICE

The following are some of the causes of LOSING CASTINGS: 1. Permeability of molding sand is too low. 2. Strength of Molding Sand is too low. 3. Molding sand is too wet. 4. Gas holes from a core buckle. 5. Gas holes around cores. 6. Overheating and soaking metal. 7. A porous horizontal line which leaks. 8. Dirty ladles. 9. Dross inclusions embedded in side walls. 10. Cooling casting too rapidly. 11. Metal was poured too hot. 12. Using the swab too freely. 13. Improper furnace combustion. 14. Soft mold ramming. 15. Improper core making. 16. Steam holes from paste in cores. 17. Proper gate but riser ill-proportioned. 18. Undried ladles. 19. Holes from parting and mold cracks. 20. Watch your charcoal. 21. Improper gate. 22. Poor core mixtures. 23. No choke in sprue or runner. 24. Cold Metal.

While we have listed the most common causes for losing castings, the making of each particular casting must be considered as an individual problem.

Lavin's metallurgical staff is always ready to assist the foundryman in finding the solution of any routine or special casting problem. Our chemical and research laboratories are available to you at no cost or obligation.

Next time call upon LAVIN'S engineering service

"The Foundryman's Problems Are Our Problems"

FREE: Write for your copy of the 20-page Lavingot technical Journal Vol. 10. No. 1 & 2 Containing, Specifications . . . test bar designs Nonferrous Ingot & Casting Alloys in chart form.

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REPRESENTATIVES IN PRINCIPAL CITIES

R. LAVIN & SONS, INC. 1900 — 54 Years — 1954 — SERVING THE FOUNDRY INDUSTRY

These furnace operators

cut fuel costs, reduced cycle time with the LIGHTEST WEIGHT insulating firebrick

Here's "production-line" proof of actual savings made by replacing heavier brick with the lightest weight insulating firebrick made today—B&W IFB.

LARGE FORGE FURNACE
Comparative Furnace Tests

	Standard Firebrick	B&W IFB	Change With B&W IFB
Furnace Output, pieces per hour	70	100	Increased 43%
Heating-Up Time, minutes	210	35	Reduced 83.3%
Cycle Time, minutes	50	30	Reduced 40%

In addition:

Fuel consumption during heating up ..... Reduced 83%
Fuel consumption during operation ..... Reduced 50%

ANNEALING FURNACE
Comparative Furnace Tests

	Standard Firebrick	B&W IFB	Change With B&W IFB
Heating-Up Time, hours	52	31	Decreased 40%
Total Cycle Time, hours	131	114	Decreased 13%
Fuel Consumption, lbs./cycle	12,792	8,159	Decreased 36%
Yearly Output, tons	946	1,100	Increased 16%

MAGNESIUM MELTING CRUCIBLE FURNACE
Comparative Furnace Tests

	Ordinary Firebrick	B&W IFB	Change With B&W IFB
Fuel Consumption BTU/HR	1,000,000	500,000	Decreased 50%
Control	100 to 150 F overshoot of critical pouring temperature	no overshoot of critical pouring temperature	

What's behind these remarkable records of B&W IFB? Light weight for one—in fact B&W IFB is lighter in weight than any other insulating firebrick. This means they store and conduct less heat, provide faster heating-up time and lower fuel consumption. These brick also respond rapidly to changes in heat input, assuring excellent temperature control.

Get all the facts on B&W Insulating Firebrick from your local B&W Refractories Engineer. He may be able to point the way to lower production costs for you.

R-483

B&W REFRACTORIES PRODUCTS—B&W Allmul Firebrick • B&W 80 Firebrick • B&W Junior Firebrick • B&W Insulating Firebrick • B&W Refractory Castables, Plastics and Mortars

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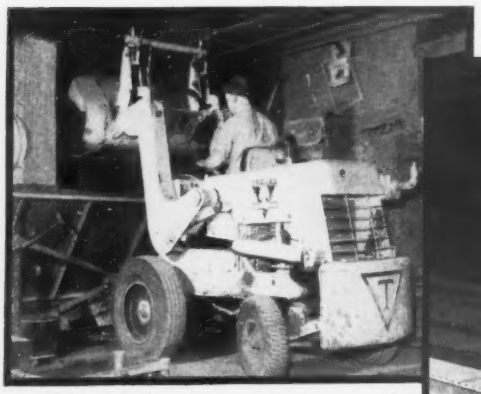
B&W

Trojan Loadsters are . . .

MAN-HOUR SAVERS!

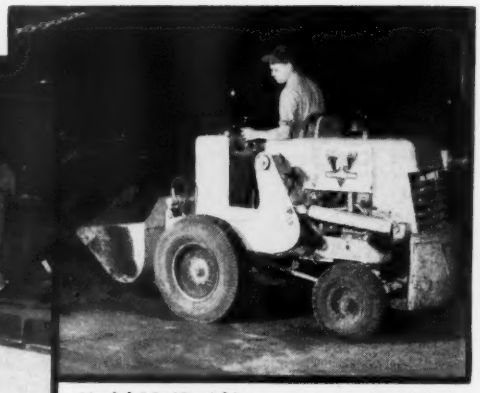
Model LA-40's versatility increases productivity. Whether unloading sand from boxcars, carrying it to mullers or storage, delivering it to molding stations or coremakers, or scooping up from pouring floors, the LA-40 does it FASTER and SAFER.

Trojan's LA-40 handles coke, slag, castings and waste just as quickly and easily, using a minimum of working space (turns in a 6'6" radius).



Model LA-40 dumping processed core and molding sand.

Model LA-40 delivering core and molding sand to molding and pouring section.



Model LA-40 picking up core and molding sand for conditioning.

exclusive BIG 3 features:

1 Reverse curve arms* for safety!

Even when the bucket is fully raised, constant 360° vision and complete safety for your operator is maintained.

(*U.S. Pat. 2,645,369)

2 Low load carrying position!

A low load is a safe load for stability and speed; especially when handling bulk material. Your operator will like Trojan's "wheel level" carrying position.

3 Independent bucket action!

Just flipping the bucket closed, this operator gets a full load everytime. Trojan's independent bucket action pries loose hard packed material, too.

There's one in the Trojan Loadster Line to fit your need —
Model LA-40 — Model LMS-75 — Model LC-100 — Model LC-100-B

CONTRACTORS MACHINERY CO., INC. • BATAVIA, NEW YORK TROJAN

Mail this coupon today for full details on Model LA-40.

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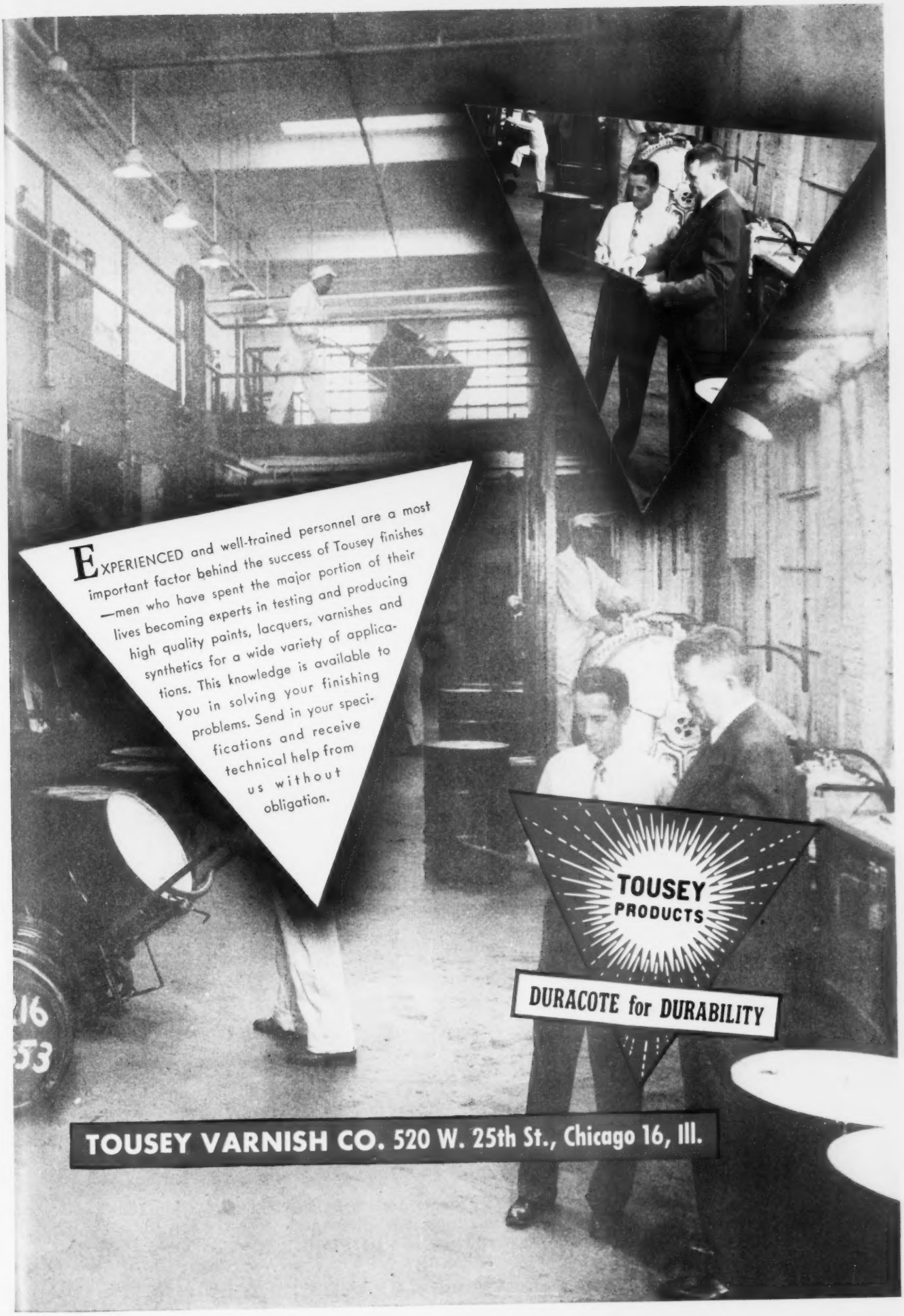
TITLE _____ COMPANY _____

ADDRESS _____

CITY _____ STATE _____


EXPERIENCED and well-trained personnel are a most important factor behind the success of Tousey finishes —men who have spent the major portion of their lives becoming experts in testing and producing high quality paints, lacquers, varnishes and synthetics for a wide variety of applications. This knowledge is available to you in solving your finishing problems. Send in your specifications and receive technical help from us without obligation.
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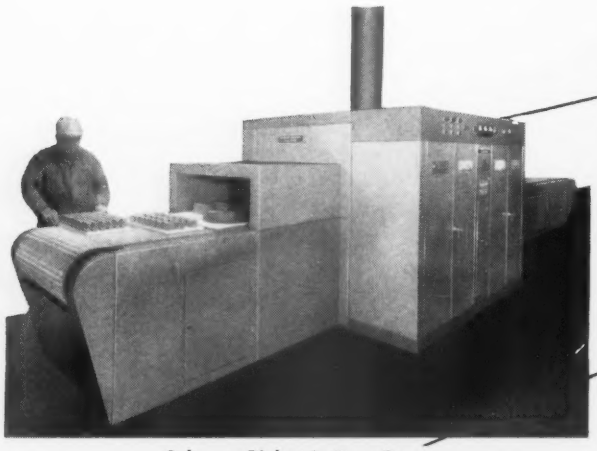
Only Coleman Ovens can improve production and lower costs for core baking and mold drying regardless of your requirement because only Coleman makes a complete line of ovens...and can recommend the best for your purpose.

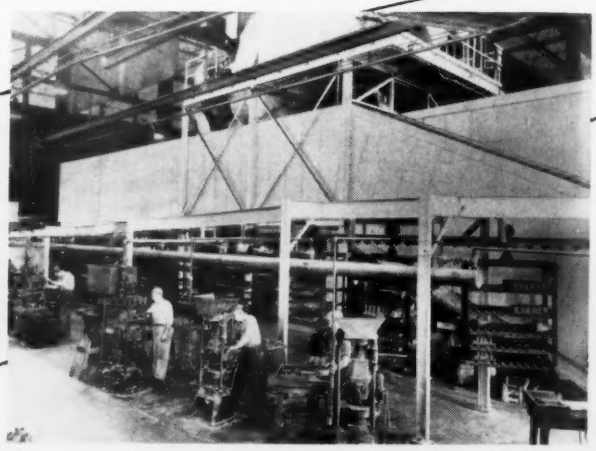
The proper selection of core and mold ovens is vital to profitable foundry operations. Coleman Ovens are built in types to fit each need exactly...and quickly pay for themselves out of direct savings in labor, materials, and reduced losses.

Benefit from 50 years of exclusive specialization in the design and construction of foundry ovens. Profit by this knowledge when you are considering a new oven installation. Coleman Oven engineers are available without obligation to make practical, unbiased recommendations for your particular requirements.

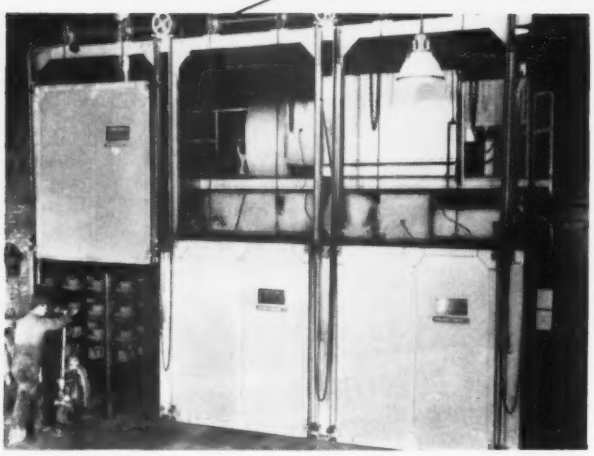
WRITE FOR BULLETIN 54



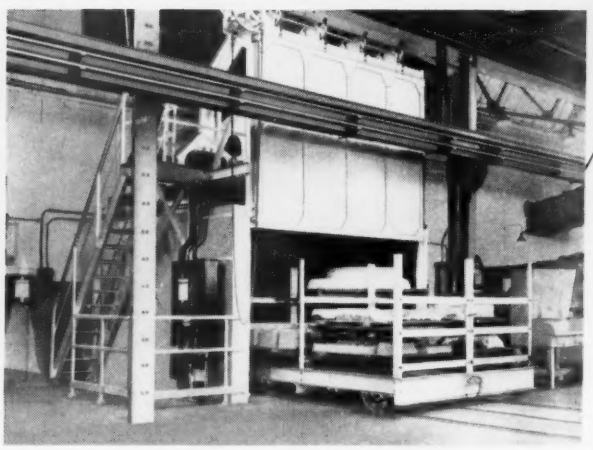
Coleman Dielectric Core Oven



Coleman Monorail Conveyor Core Oven



Coleman Transrack Core Ovens



Coleman Car Type Core Oven

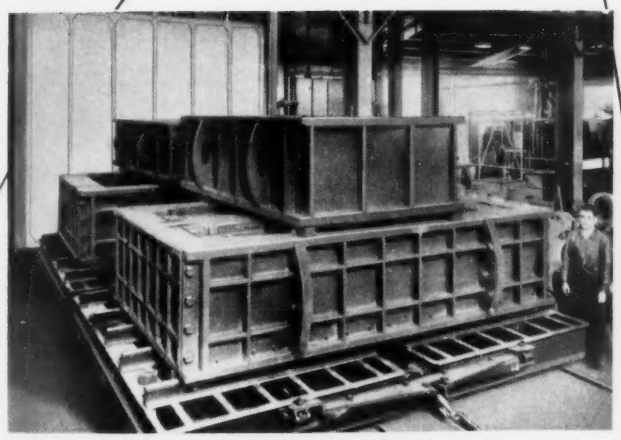
*Let us recommend the **RIGHT** type of core or mold oven for your requirements—we make them ALL!*

COLEMAN TOWER OVENS
COLEMAN DIELECTRIC CORE OVENS
COLEMAN CAR TYPE CORE OVENS
COLEMAN CAR TYPE MOLD OVENS
COLEMAN PORTABLE MOLD DRYERS
COLEMAN CONTINUOUS MOLD OVENS
COLEMAN CONTINUOUS REDRY OVENS
COLEMAN TRANSRACK OVENS
COLEMAN HORIZONTAL CONVEYOR OVENS
COLEMAN ROLLING DRAWER OVENS
COLEMAN PORTABLE OVENS
COLEMAN HEAT TREAT OVENS

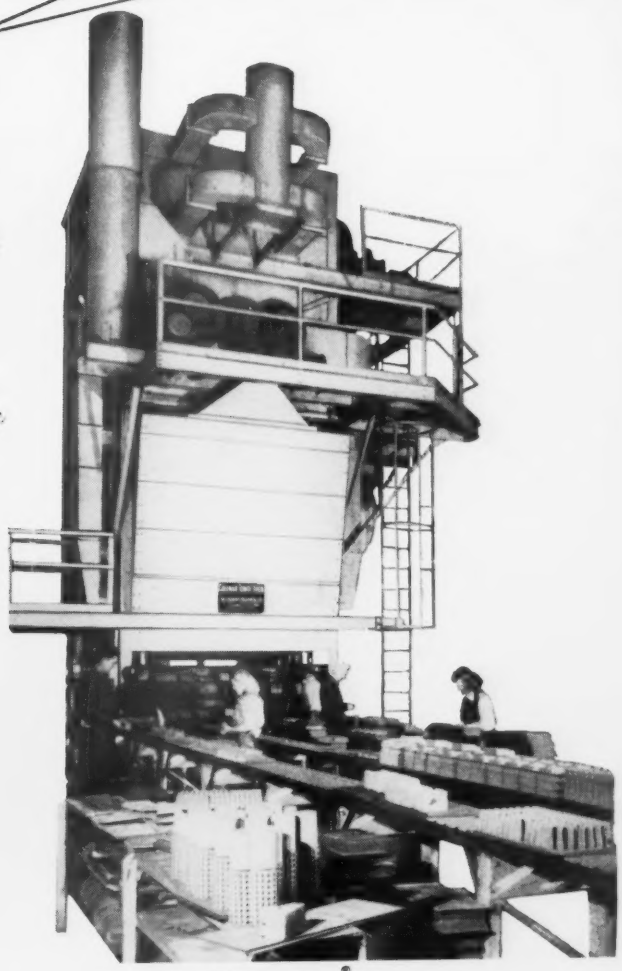
Complete line of Core and Mold Ovens

Every Type.. Every Method

to fit your requirement BEST!



Coleman Car Type Mold Oven



Coleman Tower Oven

Only COLEMAN offers a complete line of foundry ovens with all these advantages

RECIRCULATING HEATING OR DIELECTRIC SYSTEMS to meet your requirement best.

DEPENDABLE BAKING AND DRYING. Coleman Ovens remove all uncertainties in core baking and mold drying. Rejects and make-overs are eliminated.

INCREASED LABOR SAVING. Efficient and modern mechanical designs reduce handling and other indirect labor to a minimum.

HEAVY DUTY CONSTRUCTION. Responsible for dependable performance, economical operation, and minimum maintenance cost under rugged service requirements.

MAXIMUM FUEL ECONOMY. Coleman Heating Systems use the most economical fuel available to you — gas, oil, stoker-coal, electricity, etc.

FLEXIBILITY AND ACCURATE CONTROL to bake oil or resin binders—whichever is most satisfactory for your requirements.

BETTER WORKING CONDITIONS. Positive ventilation built into Coleman Ovens prevents leakage of fumes and gases—helps to make the core department a good place to work.

ADVANCED OVEN "KNOW-HOW". Coleman Engineers have pioneered and developed the most efficient oven designs to meet the highly specialized needs of modern foundry methods in all classes of work.

WIDEST EXPERIENCE. Gained through 50 years of specialization in foundry ovens and the building of more than 11,000 successful Coleman Oven installations.

THE FOUNDRY EQUIPMENT COMPANY

1821 COLUMBUS ROAD • CLEVELAND 13, OHIO

WORLD'S ONLY COMPLETE LINE OF FOUNDRY OVENS

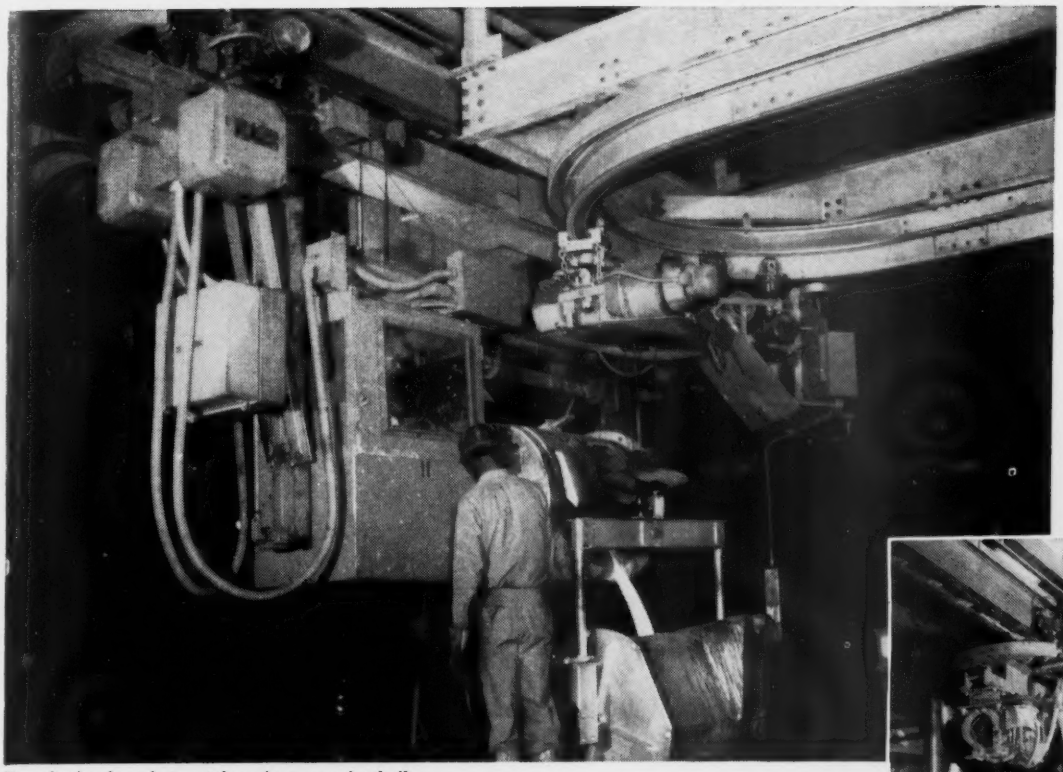
PENN SAND

SILICA FLOUR

it makes sense . . . use the best AT NO EXTRA COST

The excellent refractoriness of PENN SAND Silica Flour reduces metal penetration, minimizes surface defects and produces castings of exceptionally smooth finish. In your mold wash, you will find that constantly uniform PENN SAND Silica Flour gives the same suspension and thickness of application every time; you always get the same even coating. ● Its high fusion point and perfect uniformity also make PENN SAND Silica Flour ideally suited as an admixture to your mold and core sands. Supplied by the country's leading producer of quality silica products, PENN SAND Silica Flour is available for immediate shipment to you in a complete range of grades. ● It makes sense to use the best silica flour when it costs no more. Write today for free samples—and on your next order be sure to specify PENN SAND Silica Flour, the most economical material for mold wash.

PENNSYLVANIA PULVERIZING COMPANY
subsidiary of PENNSYLVANIA GLASS SAND CORPORATION
producers of
MOLDING SAND • CORE SAND • SHELL-MOLDING SAND • SANDBLAST SAND
General Sales Offices: GATEWAY CENTER, PITTSBURGH, PA. • Eastern Sales Office: TRENTON TRUST BLDG., TRENTON, N. J.



Transferring from hot metal carrier to pouring ladle.

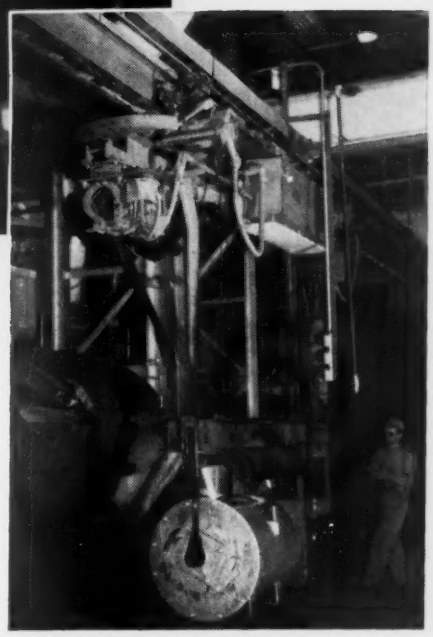
SHEPARD NILES helps Ford solve manpower problems

● Twelve Shepard Niles Hot Metal Carriers serve ten cupolas at the new Ford foundry in Cleveland.

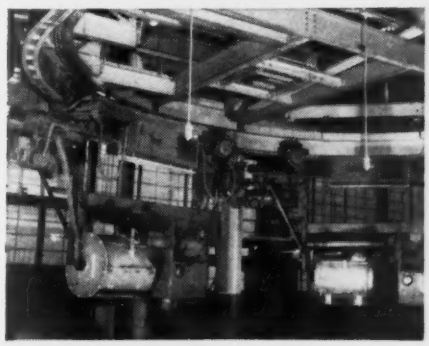
Molten metal is always delivered at exactly the proper spot because the cab of the Shepard Niles Hot Metal Carrier is at the exact level of the metal, thus affording the operator perfect vision. The many cupolas in connection with the pouring platforms are so arranged with switches and curves that the Shepard Niles Hot Metal Carrier's travel—from the cupolas to the pouring floor—is cut to a minimum.

Shepard Niles Close Clearance Hoists serve as auxilliary equipment, receiving the molten metal from the Carrier and delivering it direct to the molds on the pouring floor. Hence, one man with Shepard Niles Through-The-Air Equipment on each loop moves more metal safely, swiftly, economically.

Loads through the air since 1903.



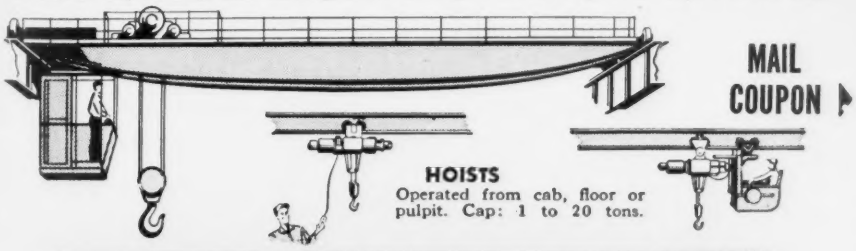
Operator leaves cab and fills transfer ladle at cupola



Hot metal carriers delivering metal from cupolas to separate pouring lines.

CRANES

Overhead: Top running, inner running, under running, floor or cab operated. Cap: 1 to 450 tons.



HOISTS

Operated from cab, floor or pulpit. Cap: 1 to 20 tons.

MAIL COUPON ▶

SHEPARD NILES Crane & Hoist Corp.
1349 Schuyler Ave., Montour Falls, N.Y.

( ) *Please send me your latest Hoist Bulletin*
( ) *Please have a representative call.*

NAME _____ TITLE _____

COMPANY _____

STREET _____

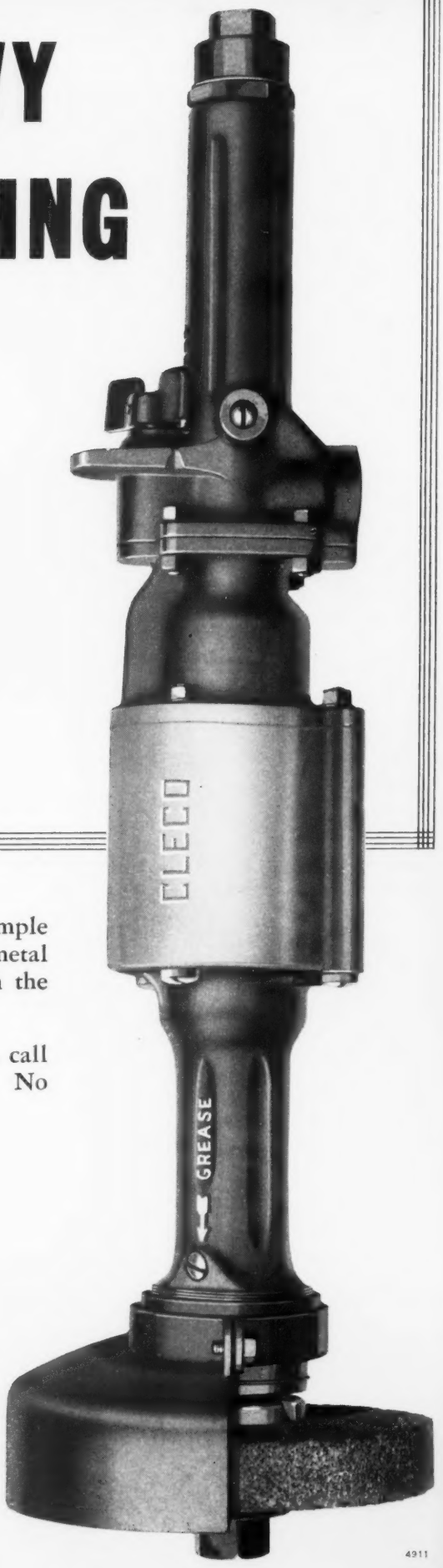
CITY _____ STATE _____

SHEPARD NILES
CRANE AND HOIST CORPORATION

FOR THE HEAVY METAL FINISHING JOBS...

CLECO

800 SERIES PNEUMATIC GRINDERS



These heavy duty Cleco Pneumatic Grinders have ample power and speed under load for your snagging and metal finishing jobs—and they are ruggedly built to stay on the job with a minimum of maintenance.

For a demonstration in your own plant, write us or call the Cleco representative or distributor nearest you. No obligation, of course.

CLECO AIR TOOLS

CLECO

DAVIS ACCESSORIES

Division of REED ROLLER BIT COMPANY

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AIR TOOLS AND ACCESSORIES

Grinders • Sanders • Rotary Drills • Riveters • Backfill Tampers
Chippers • Scaling Tools • Nut Runners • Impact Wrenches
Screwdrivers • Sump Pumps • Paving Breakers • Spike Drivers
Air Line Accessories and Fittings

4911

Pangborn Blastmaster® Barrel

Cuts Cleaning Time 2½ hrs. a day

for the Utica General Jobbing Foundry

Only absolutely clean castings will do in the manufacture of refrigerating equipment. That's why the Utica General Jobbing Foundry, Utica, N. Y., (90% of whose output is for the refrigeration industry) replaced its old cleaning barrel with a Pangborn Blastmaster Barrel. Now Utica not only gets an excellent finish on all castings but saves 2½ hours operating time daily with this machine! To quote George Buccolo, president of the firm: "Both from the standpoint of low cost and high quality, we feel our Pangborn Blastmaster is the best equipment available."

You, too, will be pleased with the *better lower-cost*, faster cleaning that a Pangborn Blastmaster Barrel gives you. (For even lower costs, Pangborn recommends the use of Malleabrasive* in your Blastmaster.) Investigate the Blastmaster now! Available in 1½, 3, 6, 12, 18 or 27 cu. ft. capacity. For more details, write for Bulletin 223A to: PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Md. And ask about *Malleabrasive*—recommended by Pangborn for use in all Pangborn equipment.

Pangborn

Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment

BLAST CLEANS CHEAPER
with the right equipment for every job

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION MEMBER FEMA

*U. S. Patent # 2184926 (other patents pending)

PANGBORN'S 50th ANNIVERSARY—1904-1954

Lift with AIR

GET THESE ADVANTAGES

CONTINUOUS SERVICE
without injury to motor

CAN'T BURN OUT
from being stalled

CAN'T OVERHEAT
from rapid reversals

NOT AFFECTED
by dust or fumes

THAT ALL ADDS UP TO

LOWER MAINTENANCE

plus

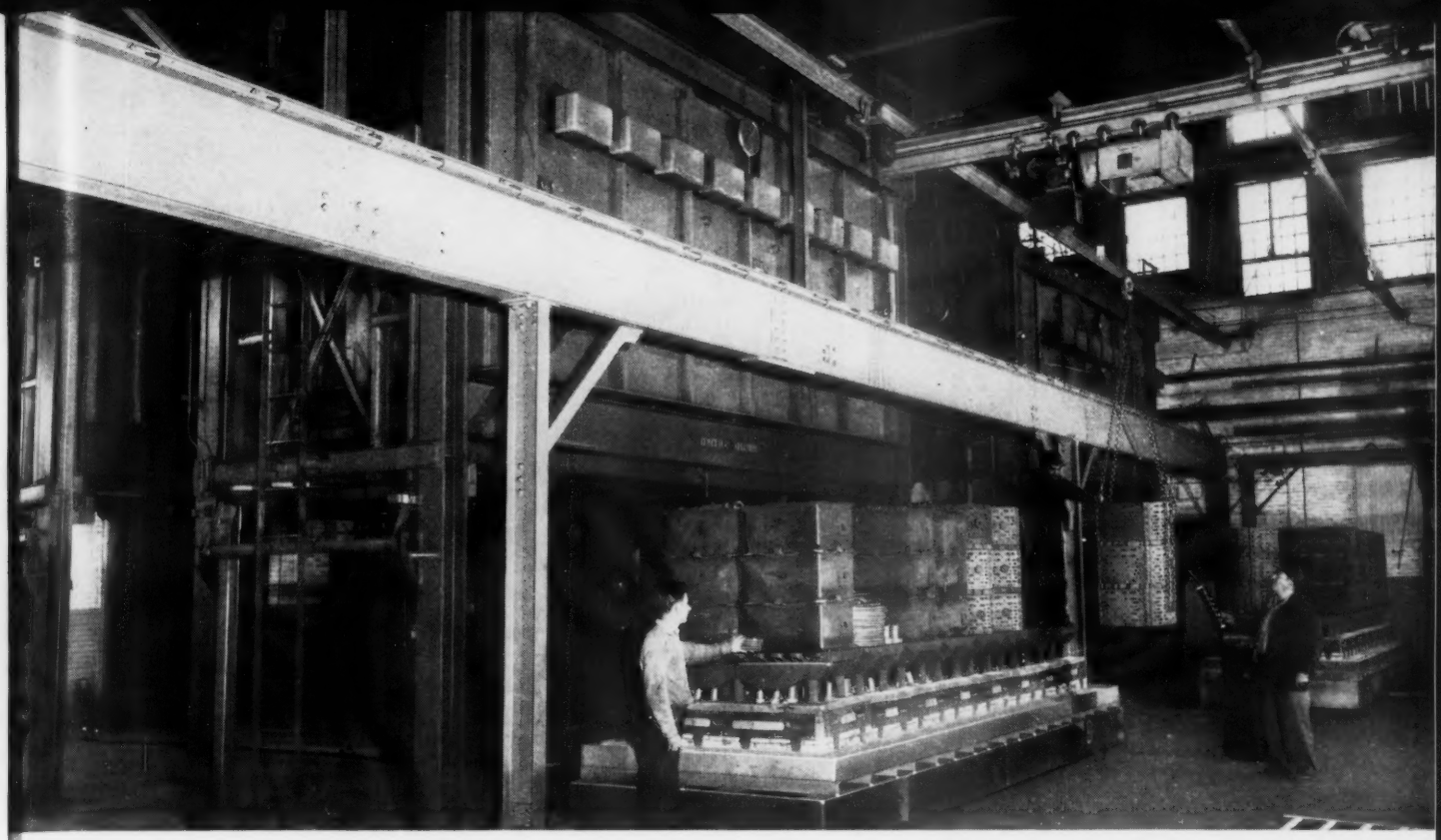
CONTROLLED SPEED
variable from 0 to 17 fpm

LIGHT WEIGHT
1,000 lb hoist weighs 28 lb

300, 1,000 and 2,000 lb capacities

KELLER AIR HOISTS

KELLER TOOL COMPANY • 1323 FULTON ST., GRAND HAVEN, MICH.



LESS FLOOR SPACE is required by these G-E furnaces. They take up only ⅓ to ½ the area occupied by old-style furnaces of equal capacity. Working conditions are improved because G-E furnaces minimize dust, dirt, and radiant heat.

Eastern Malleable Cuts Annealing Costs By Changing to General Electric Furnaces

Substantial savings in the cost of annealing malleable iron have been realized by Eastern Malleable Iron Co. since they installed General Electric elevator furnaces in their Naugatuck, Conn., plant.

5 BIG SAVINGS REPORTED

Eastern's assistant manager reports 5 significant savings that they have gained with G-E furnaces:

Lower in-process inventory and better customer service because annealing time is reduced.

Reduced pot costs—heavy cast pots are replaced by light containers that speed up heating and cooling of the charge and do not oxidize. Tightly-sealed furnaces minimize loss of natural gas atmosphere.

Decreased labor costs because G-E furnaces eliminate sand packing and fuel handling. Clean-up time is also minimized because there is no dust with electric heat.

Lower cleaning costs because G-E furnaces minimize oxidation and fused-on packing material.

Reduced rejects because G-E furnaces provide uniform heat and precise control over the time-temperature cycle.

G-E APPLICATION ASSISTANCE

Eastern Malleable's experience is another example of the benefits of modern metal processing with electric furnaces. To improve your operation, look to General Electric, a pioneer in the development of better industrial heating equipment. G-E service facilities are unmatched by any other heating equipment manufacturer. For application help from a G-E Heating Specialist, contact your nearest G-E Apparatus Sales Office.

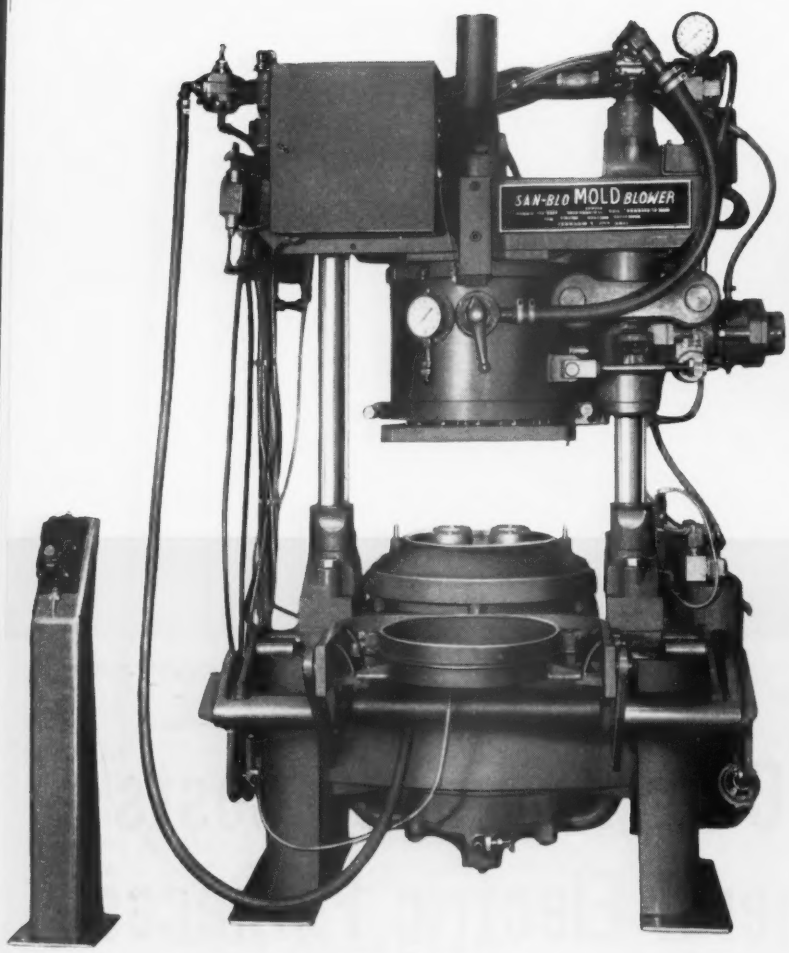
GENERAL ELECTRIC

WRITE NOW FOR THESE MODERN METAL PROCESSING BULLETINS

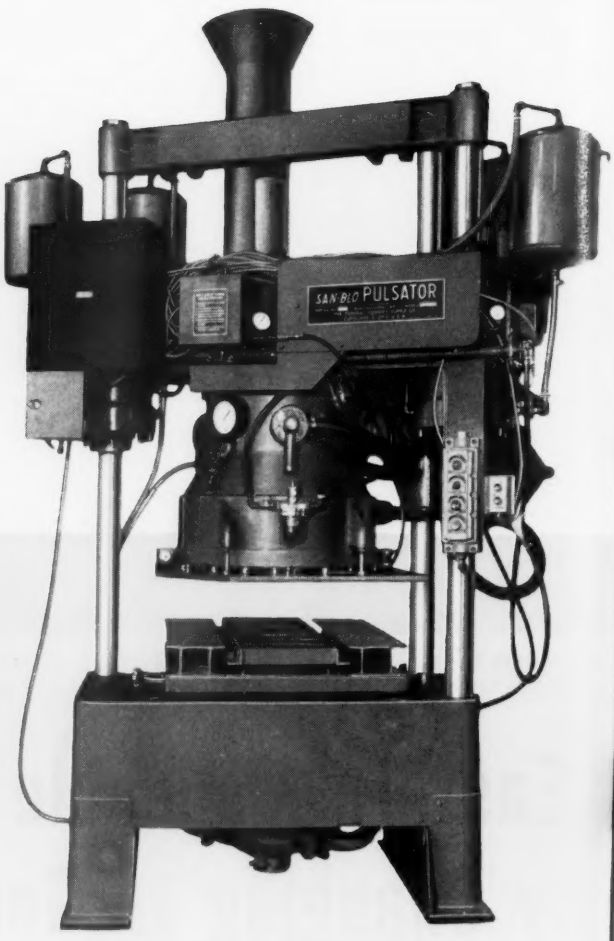
- **Furnace and Induction Brazing, GEA-5889**
- **Annealing Malleable Iron, GEA-5797**
- **Forging with Induction Heat, GEA-5983**
- **Heat-treating Aluminum, GEA-5912**

Address: General Electric Co., Section 720-132, Schenectady 5, N. Y.

YOU'VE SEEN THE SHOW . . .



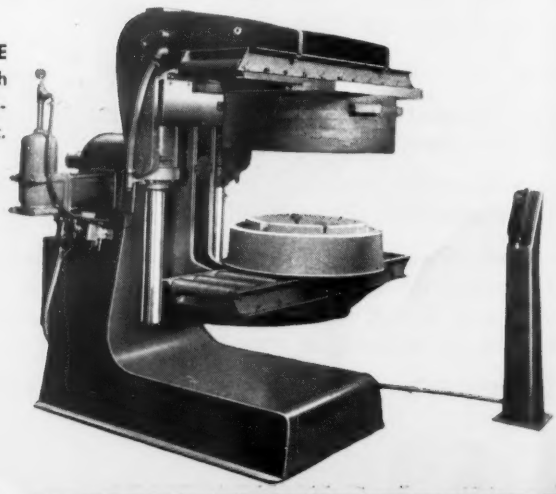
Model 150 MOLD BLOWER—Blows cope, drag or stack molds. Prefill—blow—squeeze action. Fully automatic, including handling of flask in and out of machine.

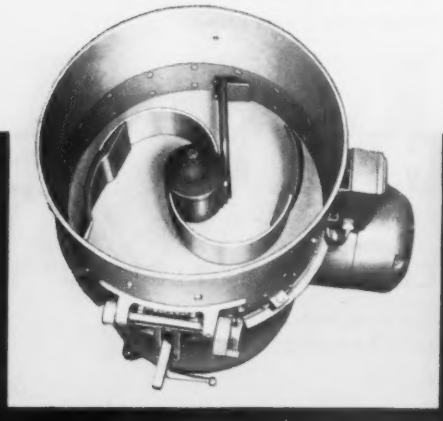


Model 250P-LPP CORE BLOWER—Blows cores from 5 to 250 lbs., in wooden or metal core boxes. Completely automatic.

FIND OUT ABOUT "CYCLO-AIR" • "LPP" • "PULSATION"

ROLLOVER-DRAW MACHINE
Specially designed for high production with the SAN-BLO "250". Fully automatic.





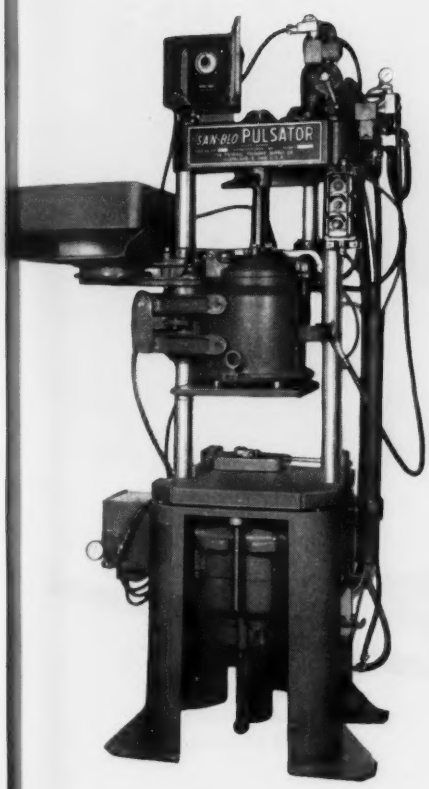
WHIRLMIX SAND MIXER
Flexible, spring steel arms mix sand thoroughly and quickly, without crushing or heating.

We'll gladly rush full information on SAN-BLO core and mold blowers . . Write for it TODAY!

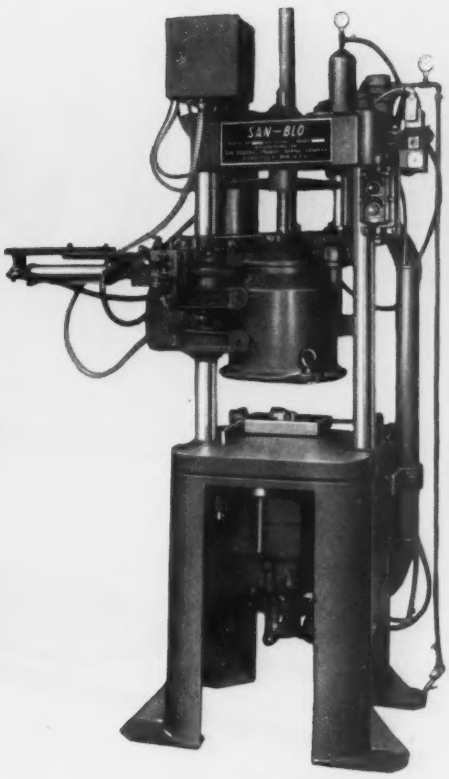
. . SO NOW YOU KNOW

it's the SAN-BLO

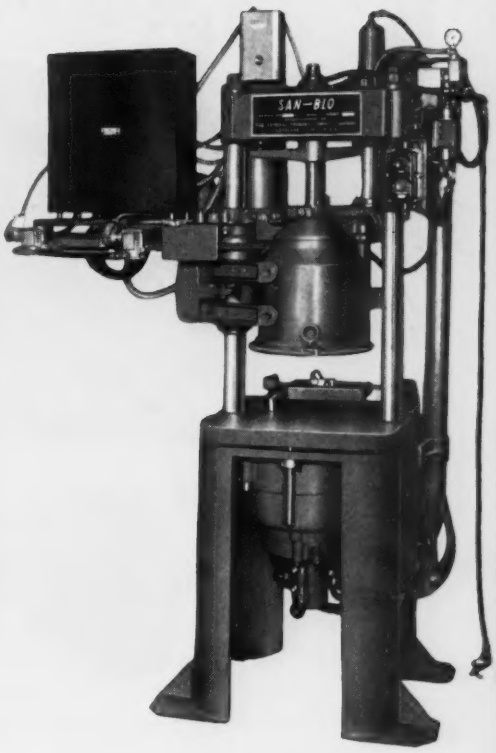
or core blowing and mold blowing!



Model 40-P-1 CORE BLOWER
For jobbing foundries. Blows cores weighing up to 40 lbs., in wooden or metal core boxes.



Model 40-D-4 CORE BLOWER
For production foundries. Cores up to 40 lbs., in metal boxes. Electrically timed blowing cycle.



Model 40-D-9 CORE BLOWER
Completely automatic, for high-speed production of cores up to 40 lbs., in metal boxes.

FEDERAL

MEMBER FEMA FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION, INC.

The **FEDERAL FOUNDRY SUPPLY** *Company*

4600 EAST 71st STREET, CLEVELAND 5, OHIO

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EUROPEAN REPRESENTATIVE: SA. PH. BONVILLAIN & E. RONCERAY Rue Paul-Carle a Choisy-Le-Roi, Seine, France

when work orders say,
Push this!
and the boss says,
Save Money!

choose GARDNER-DENVER maintenance tools

Paving Breakers

Backfill Tampers

Sheeting Drivers

Rock Drills

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Trench Diggers

Air Hoists

Clay Spaders

Portable Compressors

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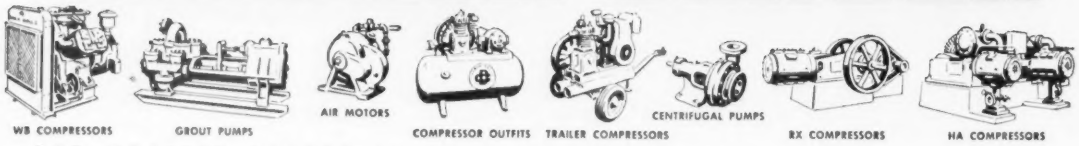
choose GARDNER-DENVER air motors

for smooth, safe, flexible power. Bulletin AM-1.

Send for our new Bulletins on Paving Breakers and Air Tools.

SINCE 1859

GARDNER-DENVER



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THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

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In Canada: Gardner-Denver Company (Canada), Ltd.
14 Curity Avenue, Toronto 16, Ontario

for economical and dependable silicon control...use GLOBE SILVERY

Globe...
the originators of
Silvery Pig Iron

By specifying Globe Silvery, foundry operators consistently achieve better castings at less cost. Globe Silvery produces a high-strength iron with high-steel mixes and is an excellent softener for thin-section work where softness and machinability are required. Also, Globe Silvery is an economical source of manganese.

Globe's 82 years of knowledge and experience in supplying the foundry industry is your assurance of quality and dependability.

We invite you to write us direct for technical or other information

globe iron company JACKSON, OHIO

SILVERY PIG and FERRO-SILICONS
GLOBE
SINCE 1872

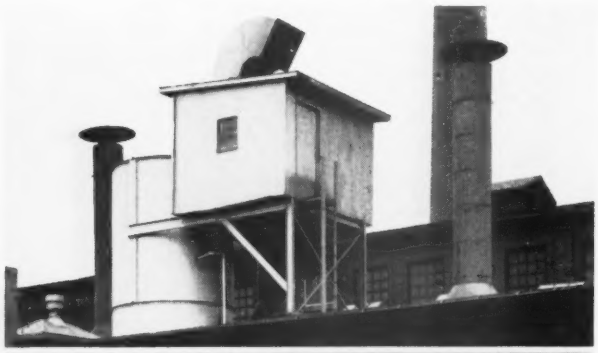
SALES REPRESENTATION

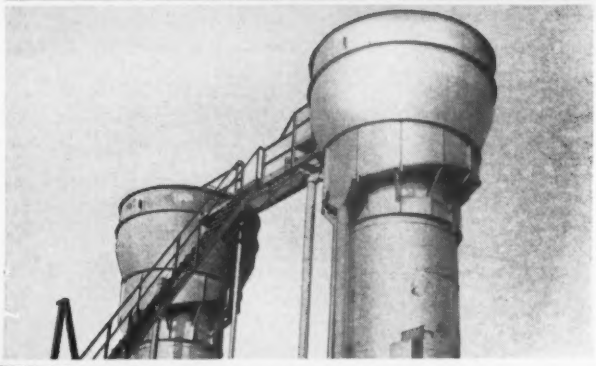
PICKANDS, MATHER & CO.; Chicago, Ill., Cleveland, O., Erie, Pa., St. Louis 1, Mo.
CLEVELAND-CLIFFS IRON CO.; Cleveland 14, Ohio
KERCHNER, MARSHALL & CO.; Cleveland 14, Ohio
MILLER AND CO.; Chicago 4, Ill., and Cincinnati 2, Ohio

For sales information, contact our nearest Sales Representative.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

Small foundries—too,
BUY SCHNEIBLE EQUIPMENT FOR BETTER DUST CONTROL!





The smaller foundries — too, are users of Schneible Dust Control Equipment. Like the large production foundries, they have found Schneible has the experience and the equipment best suited for all foundry dust control.

The Schneible line of Multi-Wash Collectors, Uni-flo Shakeout Hoods, Cupola Collectors and auxiliary units has been designed with all types and sizes of foundries in mind.

If you are considering any dust control equipment *be sure* to include a quotation from Schneible. You'll be offered equipment that suits your requirements at a price that is within your budget.

Contact the local Schneible representative or write or phone direct for detailed information.

SCHNEIBLE

Cable Address: CBSCO
European Licensee: Elex S. A., Zurich, Switzerland

CLAUDE B. SCHNEIBLE COMPANY
P. O. Box 81, North End Station • Detroit 2, Michigan

PRODUCTS

Multi-Wash Collectors • Uni-Flo Standard Hoods • Uni-Flo Compensating Hoods • Uni-Flo Fractionating Hoods • Water Curtain Cupola Collectors • Ductwork • Velocitrap • Dust Separators • Entrainment Separators • Settling and Dewatering Tanks • "Wear Proof" Centrifugal Slurry Pumps

LATE NEWS

MAY 27 1954

RATES CUT ON SCRAP: Freight rates on iron and steel scrap in Eastern Territory are scheduled to be reduced 15 per cent about mid-June. Area affected is that east of the Mississippi river and north of the Ohio and Potomac rivers. Lower rates will apply to a new minimum carload basis of 80,000 lb. Tariffs on the present minimum basis of 44,800 lb will not be adjusted, although the Institute of Scrap Iron & Steel is working on about 300 point-to-point reductions on the 44,800-lb basis. Switching rates in excess of $1 a ton also are to be cut about 15 per cent.

OPENS NEW PLANT: Fairbanks, Morse & Co. formally dedicated its new pump manufacturing plant at Kansas City, Kans., May 19. The facilities include a foundry occupying 147,600 sq ft. Designed primarily for the production of gray iron castings, the foundry also is equipped to turn out brass and stainless steel castings. A full description of the foundry, one of the most modern in the country, will be presented in a future issue.

HOUSTON NEXT: For the first time in history the Southwest will be host to a national convention of the American Foundrymen's Society when the 59th annual meeting is held in Houston, Tex., next May. Only other occasions on which the convention site has been west of the Mississippi river were the 1943 and 1949 meetings in St. Louis.

PLASTER CASTING: Plaster casting process first developed by Aluminum Co. of America in making cores for automotive torque converter castings now is being employed by the company in a wide variety of aluminum foundry applications. The process has extended the design possibilities of aluminum and magnesium castings enough to permit production of parts in the foundry that were formerly impossible. General tolerances claimed with it are plus or minus 0.010-in. across the parting line for 1 in. or less; between points produced in one part of the mold, tolerance is plus or minus 0.005-in. Alcoa is expanding its plaster casting capacity at Detroit and Cleveland and has installed new facilities at Buffalo, Bridgeport, Conn., and Vernon, Calif.

NICKEL STILL TIGHT: Although most metals now are in relatively good supply, nickel continues an exception and there is talk of putting back the controls that were dropped last fall. Defense needs and stockpiling requirements are the main factors in preventing supplies from catching up with civilian demand. Business and Defense Services Administration recently adopted a new conservation program. It includes efforts to use leaner alloys of nickel by military contractors where possible. Another step will be conferences with nondefense users to "establish production patterns by which it will be possible to use less nickel without undue loss of production performance."

LICENSE CASTING PROCESSES: Rolle Mfg. Co., Lansdale, Pa., has been licensed to use both the Al-Fin and Osbrink castings processes. Al-Fin is a patented process for the molecular bonding of aluminum, magnesium and their alloys to ferrous metals, nickel and titanium. The Osbrink process for precision, thin-walled sand castings permits shell walls only 0.100-in. thick, with tolerances of 0.010-in. or better for dimensions up to 6 in.

PRICE INDEX RISES: Reflecting general primary market price increases which brought the wholesale price index for April to the highest point since October, 1952, foundry and forge shop products prices stood at 129.4 for that month, according to the U. S. Department of Labor index. The index is based on the 1947-49 average. This figure is unchanged from a month earlier, but is 5.4 points higher than in April, 1953.

LIGHT METALS COURSE: Recognizing the growing importance of light metal castings, Massachusetts Institute of Technology is offering a special summer program called "Casting of Light Metals" from Aug. 23 through Sept. 3. Under the direction of Prof. Howard F. Taylor, who will be assisted by other members of the

MIT staff and by guest lecturers from industrial and research organizations, the program will include three lectures per day. Equal attention will be given to theory and practice. Tuition is $160, payable upon notification of admission. Further information is available from Prof. Ernest H. Huntress, director of the summer session, Room 7-103, MIT, Cambridge 39, Mass.

ALUMINUM PRODUCTION: Unlike iron and steel, primary aluminum production so far this year is well ahead of 1953. Production through April totaled about 939 million pounds, against slightly more than 778 million a year ago.

OBITUARY: Roy N. Hoffman, president and general manager, Michigan Malleable Iron Co., Detroit, died recently . . . Arthur J. Westphal, vice president-sales and secretary, Atlas Steel Casting Co., Buffalo, died May 11 following an automobile accident.

PERSONALS: Ford R. Snyder, metallurgical engineer in charge of sales development, Hickman, Williams & Co., Chicago, has been elected a director . . . Morehead Patterson, chairman and president, American Machine & Foundry Co., New York, has been named deputy representative of the U. S. on the United Nationals Disarmament Commission . . . American Standards Association has appointed George P. Paine assistant secretary and John W. McNair assistant technical director.

MISCELLANY: January consumption of aluminum-base scrap totaled 27,248 tons, according to the Bureau of Mines. Secondary smelters accounted for 63 per cent, primary producers for 28 per cent and foundries and others 9 per cent . . . Arneson Foundry Inc., Kenosha, Wis., has been issued a certificate for rapid tax writeoff covering $33,000 of plant facilities . . . *Foundryways*, published by Belle City Malleable Iron Co., Racine, Wis., was judged the most improved magazine in a contest sponsored recently by the Wisconsin Manufacturers' Association . . . M. Greenberg's Sons Brass Foundry & Machine Works, San Francisco, observed its 100th anniversary on May 5.

PRICES OF FOUNDRY METALS AND COKE (As of May 24, 1954)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE	
Connellsville	$16.50–17.00
OVEN	
Birmingham	$22.65
Chicago	24.50
Detroit	25.50
Erie, Pa.	25.00
Everett, Mass.	23.50
Indianapolis	24.25
Kearney, N. J.	24.00
Milwaukee	25.25
Painesville, O.	25.50
Philadelphia	23.00
Portsmouth, O.	24.00
St. Louis	26.00
St. Paul	23.75
Swedeland, Pa.	23.00
Terre Haute, Ind.	24.05

PIG IRON

(Per gross ton f.o.b. furnace)

	No. 2 Foundry	Malleable
Bethlehem, Pa.	$58.50	$59.00
Birmingham	52.88	....
Buffalo	56.50	57.00
Chicago	56.50	56.50
Cleveland	56.50	56.50
Everett, Mass.	61.25	61.75
Fontana, Calif.	62.50	....
Geneva, Utah	56.50	....
Granite City, Ill.	58.40	58.90
Lone Star, Tex.	52.50	52.50
Neville Island (Pittsburgh)	56.50	56.50
Steelton, Pa.	58.50	59.00
Swedeland, Pa.	58.50	59.00
Toledo, O.	56.50	56.50
Troy, N. Y.	58.50	59.00
Youngstown, O.	....	56.50

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 27.00; tin bronze, No. 225, 39.00; No. 245, 33.25; high-leaded tin bronze, No. 305, 31.50; No. 1 yellow, No. 405, 23.25; manganese bronze, No. 421, 26.75.

ALUMINUM: 99 per cent plus, primary ingots 21.50c. Secondary No. 12 alloy 19.75-20.25. Deoxidizing grades: No. 1 20.50-21.00; No. 4 17.00-18.00.

MAGNESIUM: 99.8 per cent standard ingots 27.00c, f.o.b. Freeport, Tex.

COPPER: Electrolytic 30.00, delivered Connecticut valley.

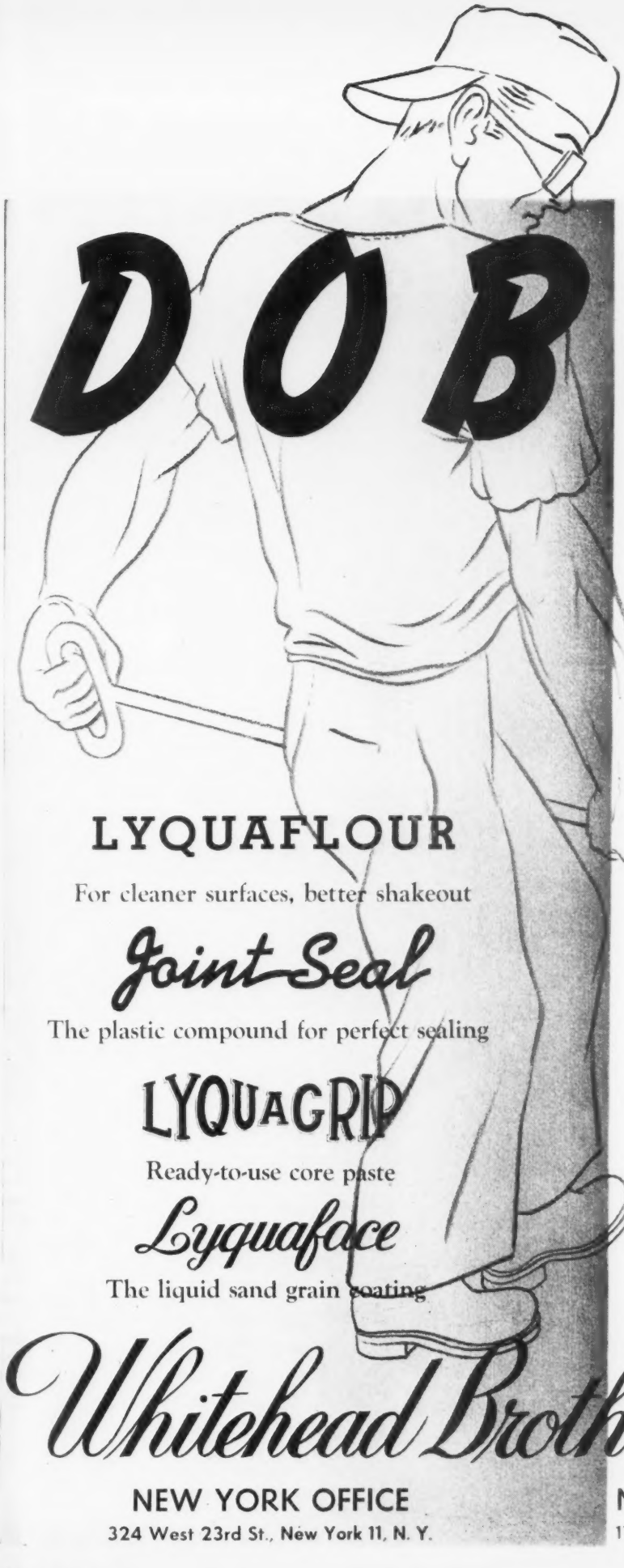
ZINC: High grade 11.60, delivered. Die casting alloy 14.25c, delivered.

IRON AND STEEL SCRAP

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$19.00–20.00	**$42.00–43.00	**$28.00–29.00	.....	.....	.....	$39.00–40.00
Boston*	**17.00	**29.00–30.00	.....	.....	**32.00–33.00	.....	.....
Buffalo	25.00–26.00	**39.00–40.00	.....	.....	**41.00–42.00	.....	40.00–41.00
Chicago	31.00–32.00	38.00–39.00	.....	40.00–42.00	41.00–42.00	40.00–42.00	44.00–46.00
Cincinnati*	**25.00–26.00	**38.00	**36.00	.....	**46.00	.....	**44.00–45.00
Cleveland	28.00–29.00	41.00–42.00	26.50–27.50	43.00–44.00	43.00–44.00	41.00–42.00	44.00–48.00
Detroit*	**21.00	**36.00	**26.00	**40.00	.....	**28.00	.....
Los Angeles	20.00	40.00	.....	.....	.....	.....	.....
New York*	17.00–18.00	29.00–30.00	.....	.....	.....	.....	.....
Philadelphia	23.00	35.00–36.00	35.50	.....	41.00	39.00	41.00
Pittsburgh	30.00–31.00	37.00–38.00	30.00–31.00	.....	43.00–44.00	.....	44.00–46.00
St. Louis*	26.50	37.00	29.00	39.00	.....	.....	41.00
San Francisco	20.00	40.00–42.00	36.00	39.00	43.00	.....	.....
Seattle	23.00	**30.00–35.00	**25.00	.....	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point.

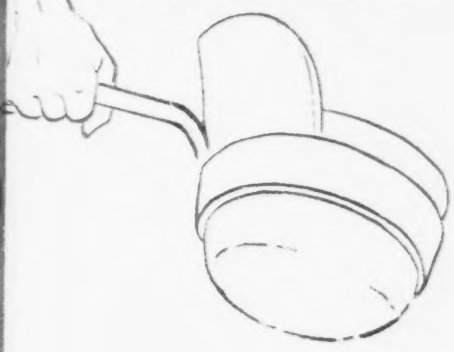


Established 1841

DOB-IT

A ready mixed, ready to use, labor saving core mudding compound

1. **DOB-IT** will not dry out in storage. There is no waste.
2. **DOB-IT** is extremely easy to apply.
3. **DOB-IT** has good facing value.
4. **DOB-IT** will not blow when dry. Has very low gas evolution.
5. **DOB-IT** contains no silica or other abrasive.
6. **DOB-IT** can be used for dry sand patching.
7. **DOB-IT** washes off hands easily.



8. **DOB-IT** makes an excellent patch for broken cores.
9. **DOB-IT** reduces mudding time by 30%.
10. **DOB-IT** requires no water or special mixing by coremaker.
11. **DOB-IT** is shipped ready to use.

You Owe It To Yourself To Investigate Our Claims.

LYQUAFLOUR

For cleaner surfaces, better shakeout

Joint-Seal

The plastic compound for perfect sealing

LYQUAGRID

Ready-to-use core paste

Lyquaface

The liquid sand grain coating

Whitehead Brothers Company

NEW YORK OFFICE
324 West 23rd St., New York 11, N. Y.

NEW ENGLAND OFFICE
17 Exchange Place, Providence 1, R. I.

New 1 MODEL F

● Photos show Mr. T. E. Huston (left), Vice-President of Xenia Foundry & Machine Co. with their new No. 1 Model F Mix-Muller. Note convenient discharge mechanism and sturdy, safe sand sampler.

"Big capacity and positive mulling have reduced sand preparation time by 30%. New Simpson has eliminated facing down time and has consistently improved castings' finish," says Mr. Huston.

MIX-MULLER CUTS MULLING TIME BY 30%!

Here's an interesting report from XENIA FOUNDRY & MACHINE COMPANY, Xenia, Ohio . . . on some "gratifying gains" realized after only 6 weeks' use of their new Simpson Mix-Muller.

One of our first customers for the new No. 1 Model F Mix-Muller was W. M. Huston, President of Xenia Foundry. Mr. Huston was impressed by the compact design of the new unit . . . and its apparent suitability for his needs in producing small and medium size gray iron castings. Mr. Huston wrote us only *6 weeks* after the No. 1F was installed—reporting "excellent results" and some "particularly gratifying gains":

"Our whole mulling cycle has been cut about 30%, due to the increased capacity and the reduced mulling time. Facing down time has been entirely eliminated."

"By having a well mulled facing sand, we have been able to produce a much better casting finish. This gain has extended to our cleaning room, and an appreciable savings in cleaning time and supplies."

"Needless to say, your 1-F Simpson Mixer has corrected basic problems. We would highly recommend this unit to foundries of our size and type."

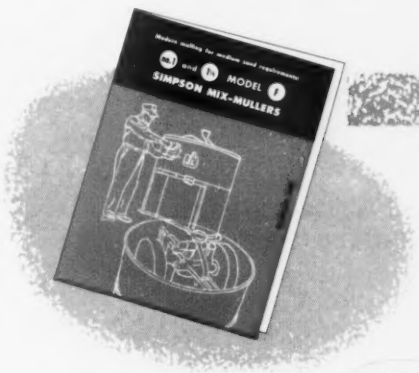
Xenia Foundry & Machine Company is just one of many progressive foundries that are daily realizing that the new F Series Simpson Mix-Mullers are the *modern* way of preparing sand . . . and are essential to present day molding practice.

There is a Simpson Mix-Muller for *every* batch capacity requirement: 50 • 250 • 500 • 1000 • 1500 • 2000 • 3000 and 4000 pounds. YOUR requirements are included—so why not write for further details? State your needs and let a National foundry engineer show you how you can attain more positive mulling for *your* money with a Simpson Mix-Muller.

WRITE FOR BULLETIN 520

This new bulletin gives details on two new Mix-Mullers—the No. 1 F and the No. 1½ F. Designed for medium capacity needs of 500 lbs. and 1000 lbs. respectively, here are a few of the plus features offered at no extra cost:

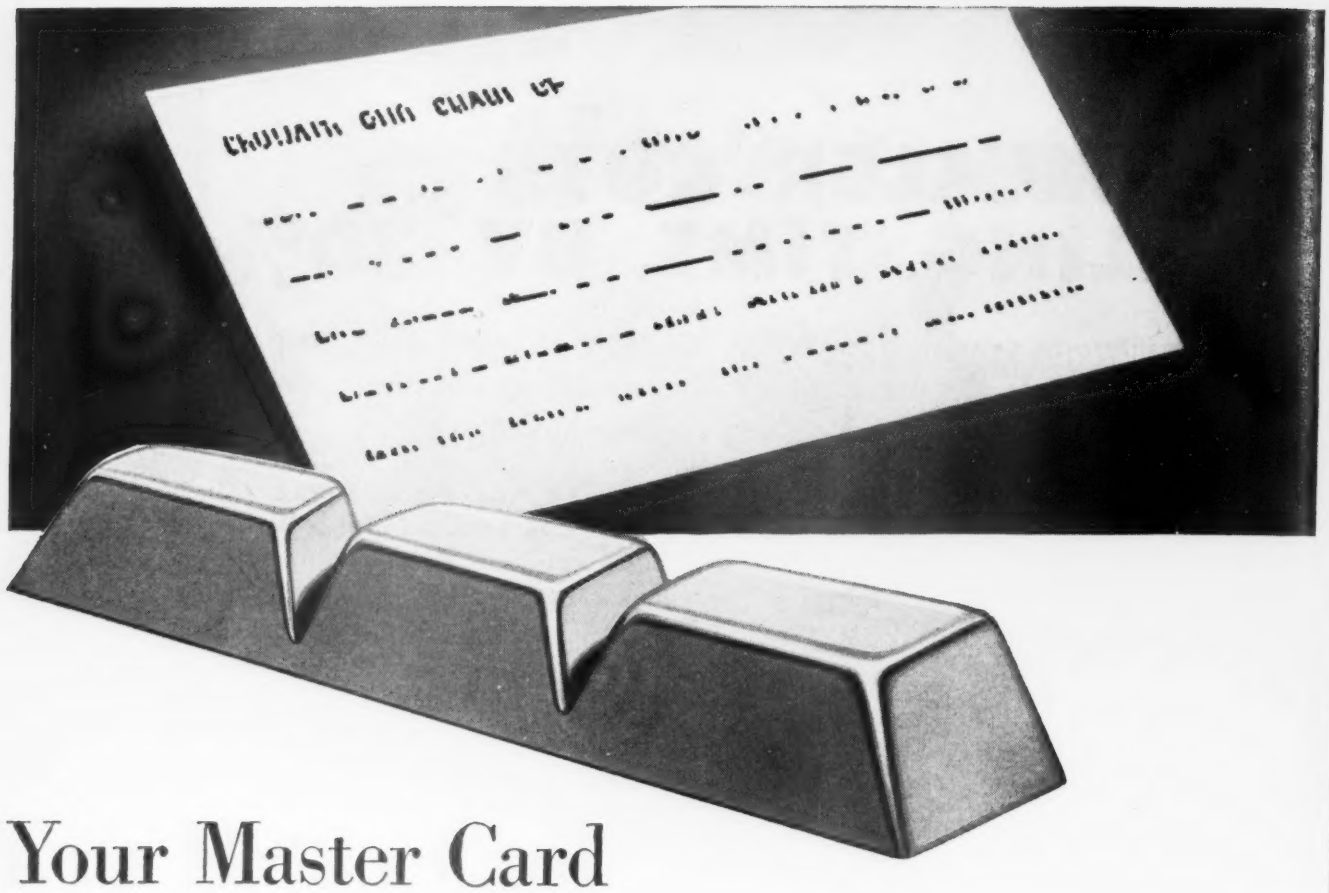
CRIB SCRAPERS • CENTRAL LIQUID ADDITIONS FUNNEL • V-BELT UNIT DRIVE • SPRING LOADED MULLERS • ANTI-FRICTION BEARINGS THROUGHOUT



National Engineering Company
(Not Inc.)
646 Machinery Hall Bldg. • Chicago 6, Illinois

NATIONAL SAND PREPARING & MOLD HANDLING SYSTEMS

SIMPSON *Intensive* MIX-MULLERS



Your Master Card Specifications NEVER CHANGE—

EDCO ALUMINUM INGOT

Whatever your ingot requirements—whether a *standard*, or a special personalized formula developed especially for you by EDCO specialists—EDCO records your specifications on a Master Card.

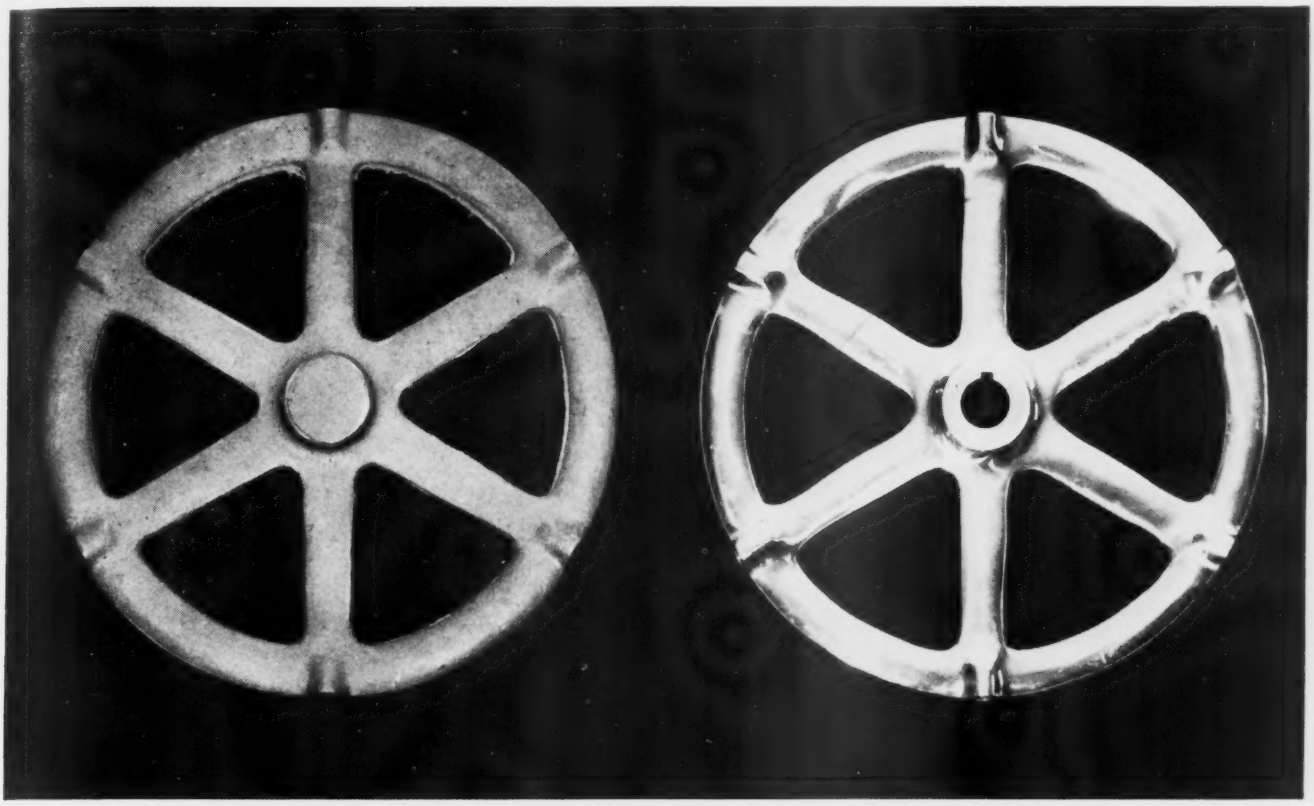
No matter how often you re-order, EDCO follows *and meets* the specifications shown on that Master Card.

CHRISTIANSEN CORPORATION

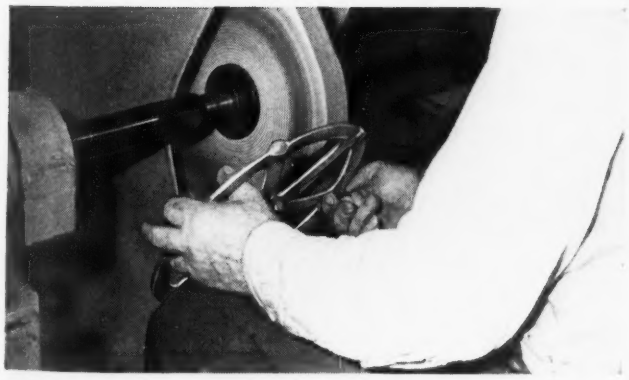
210 SOUTH MARION STREET • OAK PARK 1 (Chicago Suburb), ILLINOIS

EDCO DOWMETAL BOTTOM BOARDS • EDCO ALUMINUM INGOT

3M METHOD—better from start to finish



Brooklyn manufacturer doubled production with 3M Abrasive Belts!



10 Finished Wheels per belt! *3M Coated Abrasives are production "tools" scientifically manufactured to do a better, faster grinding and finishing job.*

Yes, Perkins Marine Lamp and Hardware Co. doubled their production of finished bronze marine steering wheels when they switched to the 3M Method using 3M Abrasive Belts. This maker of fine hardware for sea-going pleasure boats formerly used grinding wheels —averaged only 1 polished casting per hour. Now, with 3M Abrasive Belts, unit costs have been cut 50%, with far better finishes.

3M Coated Abrasives can do a job for you, too. Your 3M Representative is an abrasives expert who can help you install the 3M Method. Send coupon today for facts. There's no cost or obligation.

Write Today for FREE Booklet!

Made in U.S.A. by Minnesota Mining and Mfg. Co. General Offices: St. Paul 6, Minn. In Canada: London, Ont., Can. Export: 122 E. 42nd St., New York City. Makers of "Scotch" Pressure-Sensitive Tapes, "Scotch" Sound Recording Tape, "3M" Adhesives, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing.

3M ABRASIVES

MINNESOTA MINING AND MFG. CO.
Dept. F-64, St. Paul 6, Minn.

☐ *Send me free booklet on grinding of nonferrous metals.*
☐ *I'd like to talk to a 3M Representative.*

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MY DISTRIBUTOR IS _____

Fairbanks-Morse Pump Works
Kansas City, Kansas

Another Successful FAIRBANKS-MORSE PLANT

Congratulations to Fairbanks-Morse on this important addition to their great industrial system. Within this one plant are machine shops, foundry, power plant, complete office and service facilities. Lester B. Knight & Associates, Inc. were honored to assist Fairbanks-Morse engineers from the outset of the project to its completion.

To effect maximum speed, economy, and ultimate operational efficiency, Fairbanks-Morse centralized responsibility for plant layout, engineering, design, issuing of bids, and construction supervision with one comprehensive engineering and architectural organization.

Three-dimensional models, constructed by Knight Models, Inc., permitted major construction economies and visual training for supervisory personnel before completion of the plant.

The successful coordination of Fairbanks-Morse and Knight engineers is witnessed by the fact that, within a few months of operation, production is already satisfactorily up to schedule.

Whether you intend to build a new plant or improve your present operation, Knight engineers are qualified to assist you. They will call upon you at your convenience.

Knight Foundry Services Include:

- Foundry Engineering
- Architectural Engineering
- Construction Management
- Organization
- Management
- Industrial Engineering
- Wage Incentives
- Cost Control
- Production Control
- Modernization
- Mechanization
- Materials Handling
- Automation
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EVIDENCE OF EXPERIENCE

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MEMBER OF THE ASSOCIATION OF CONSULTING MANAGEMENT ENGINEERS, INC.

600 W. Jackson Blvd., Chicago 6

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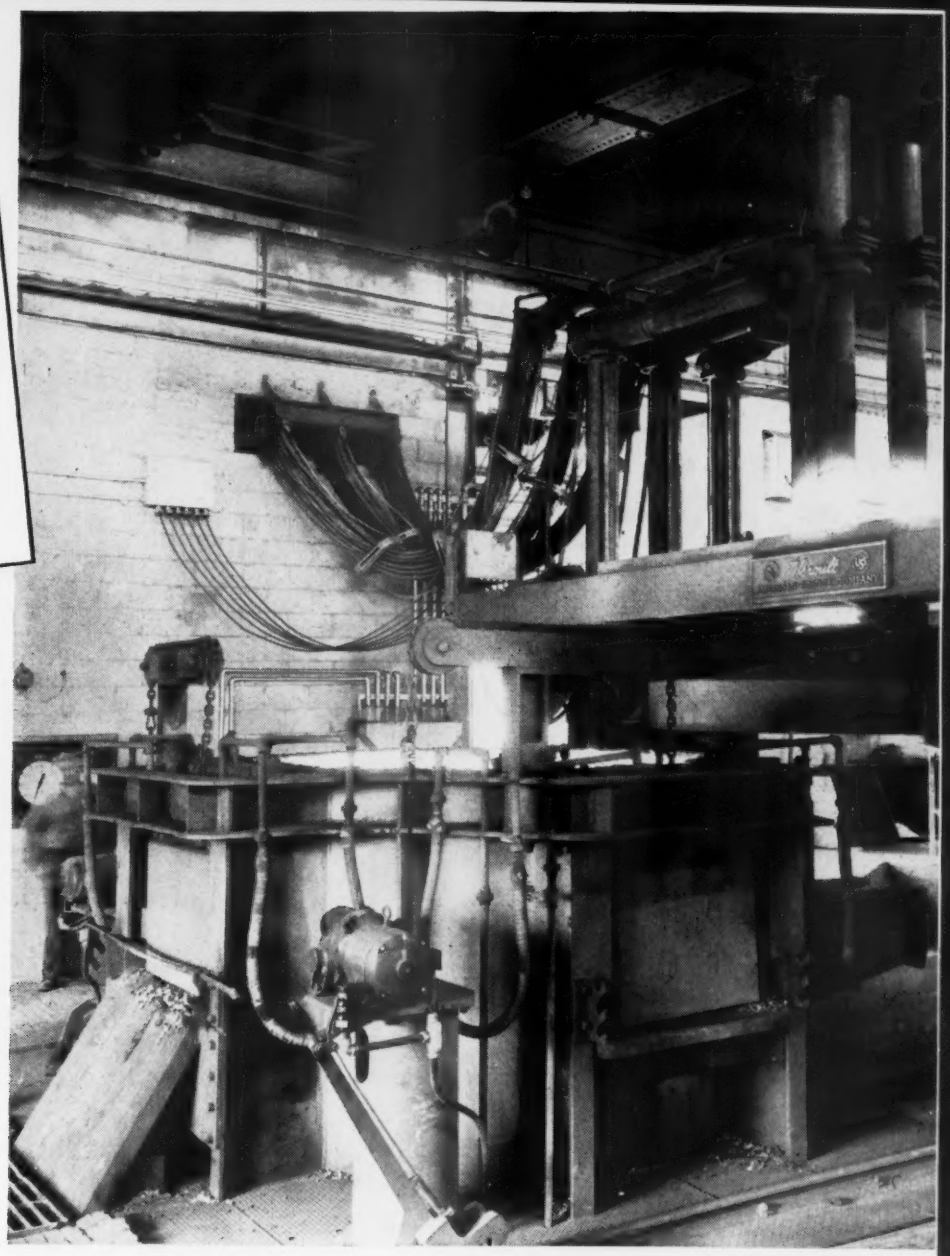
Heroult
ELECTRIC MELTING FURNACES



The high production capacity of the Heroult makes it the foundryman's favorite furnace!

NEW CATALOGUE
Now Ready

Contains up-to-date information on Heroult Electric Melting Furnaces – types, sizes, capacities, ratings, etc. For free copy, write to our Pittsburgh office.

AVAILABLE in foundry sizes with either Gantry or swing-type roof, these widely used furnaces are equipped with the latest time- and labor-saving mechanical devices and electrical controls. They are noted for their efficient performance, low operating and maintenance costs.

We welcome an opportunity to help you select and install the foundry furnace best suited to your requirements.

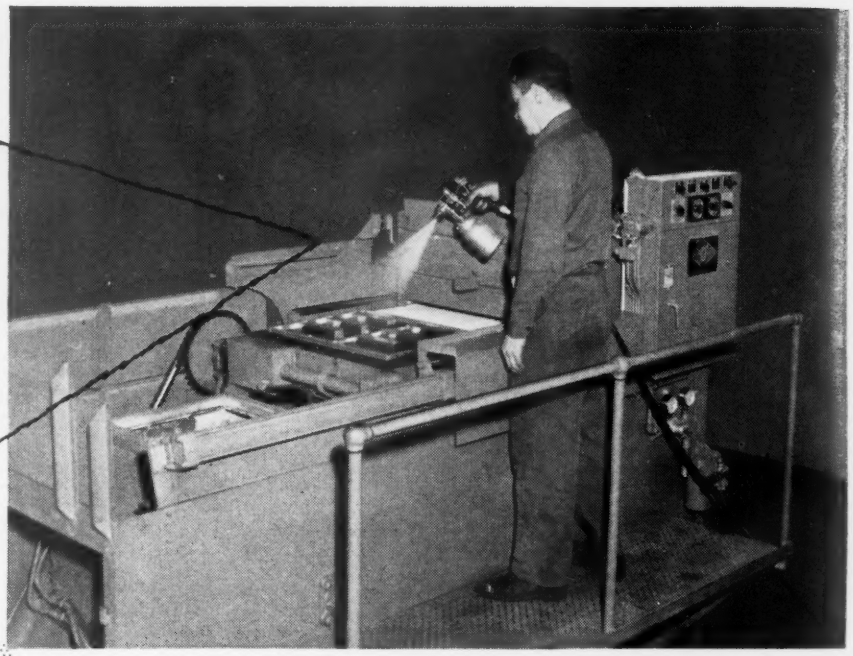
AMERICAN BRIDGE DIVISION, UNITED STATES STEEL CORPORATION
GENERAL OFFICES: 525 WILLIAM PENN PLACE, PITTSBURGH, PA.

Contracting Offices in New York, Philadelphia, Chicago, San Francisco and other principal cities.
United States Steel Export Company, New York

USS

UNITED STATES STEEL

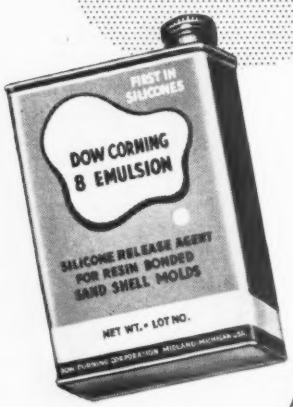
FOR POSITIVE, CLEAN RELEASE OF SHELL MOLDS



Pattern capacity of the new shell mold unit designed by Shell-O-Matic, Inc., of Newark, N. J., has been enlarged to 22" x 26" x 28" yet the unit still requires only 40 square feet of floor space when bedded or used with a platform. Compact and self-contained, the new Shell-O-Matic features 21,000-watt strip pattern heaters, a 15,000-watt infra-red curing oven, and an automatic shell ejection system. Only two connections, for air and electricity, are required.

specify DOW CORNING 8 EMULSION

. . . the Standard Silicone Parting Agent for fast, accurate and low cost shell molds and core production



You can rely on Dow Corning 8 Emulsion to deliver shell molds promptly, easily and economically. And this heat-stable silicone release agent keeps patterns clean, too, because it can't break down at molding temperatures to form a carbonaceous deposit on pattern surfaces. Maintenance costs are kept to a minimum and you get uninterrupted production of uniformly accurate shells and castings.

Nonflammable and noncorrosive, Dow Corning 8 Emulsion is easily diluted with hard or soft water and is highly resistant to creaming or separating in storage or after dilution. For more information and a free trial sample call the branch office nearest you or mail the coupon today.

Send for sample TODAY

DOW CORNING CORPORATION, Dept. AH-18
Midland, Mich.

Please send me ☐ Free sample of Dow Corning 8 Emulsion
☐ Data on Silicone Release Agents for the Shell Process

Name _____

Company _____

Street _____

City _____ Zone ___ State _____

DOW CORNING SILICONES

DOW CORNING CORPORATION
MIDLAND MICHIGAN

ATLANTA CHICAGO CLEVELAND DALLAS DETROIT LOS ANGELES NEW YORK WASHINGTON, D.C. (Silver Spring, Md.)

Canada: Dow Corning Silicones Ltd., Toronto Great Britain: Midland Silicones Ltd., London France: St. Gobain, Paris

WESTINGHOUSE • PRIER BRASS MFG. CO. • READING GRAY IRON CASTINGS, INC.
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E. L. LeBARON FOUNDRY CO. • STANDARD FOUNDRY CO. • HARTFORD ELECTRIC STEEL CORP.
BULLARD CO. • WELLMAN BRONZE • COOPER ALLOY • TEXAS ELECTRIC STEEL

Two Good Reasons Why These and Many Other Famous Foundries have switched to

BS&B FOUNDRY FLASKS

1 The way they're made

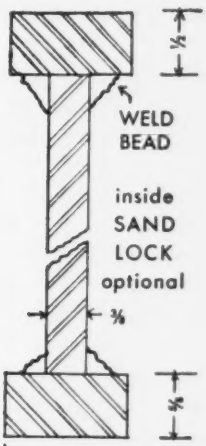
BS&B Foundry Flasks are designed by men with actual foundry experience. They know from experience the features you want! From their designs, BS&B's skilled workmen can turn out a flask tailor made for you. Your BS&B Flask will have the greatest rigidity, with minimum weight for easy handling. BS&B Flasks are constructed entirely of steel . . . all parts joined together with electric arc welding . . . sections are surface ground or machined, top and bottom, to insure a tight joint at the parting line . . . pinholes fitted with removable hardened steel bushings—round and oblong. Pinlug arrangements to your individual requirements.

2 The way they stand up

Pennies make you dollars where BS&B Foundry Flasks are concerned. Maybe you do pay a little more for BS&B Flasks . . . but you get dollars of extra value. BS&B Flasks require a minimum of maintenance year in and year out. They stand up—turn out better casings, keep scrap down. Actually, BS&B customers report six-eight-ten even twelve years of operation—without maintenance expense! Here's proof BS&B Foundry Flasks are built to stand continued use under hard working conditions and vigorous shake out. Cost records maintained by many foundries prove BS&B Foundry Flasks withstand more castings per flask throughout their service life.

Have a really tough, heavy casting job to do? Then put this one into service

BS&B Heavy Duty Flask Style FP 22



The only flask made combining these three features: (1) Welding of bearing strips, both inside and out; (2) Cast steel trunnions; (3) Cast steel pinlugs and clamplugs. Reinforcing rib is optional. Design and method of fabrication eliminates corner cracking and breaking out.

Write for FREE BS&B Foundry Flask Handbook
a handy catalog and useful foundryman's "bible"
includes easy-to-order system.
Foundry Flask Div.—Dept. 7-AR6

FOUNDRY OUR 60TH YEAR BS&B FLASKS

BLACK, SIVALLS & BRYSON, INC.
7500 East 12th Street Kansas City 26, Missouri

CARBOFLEX

TRADE MARK

depressed center wheels

BRAND NEW...FOR FAST, SAFE

Reduce rough welds... *fast, safely!*

Remove flash from castings... *fast, safely!*

continually putting more sense in your abrasive dollar...

Finish rough edges... *fast, safely!*

Cut off or slot... *fast, safely!*

ROUGH GRINDING AT LOW COST

Roughing? Grinding Welds? Cutting off? Slotting?—here's a great new cost-cutter by CARBORUNDUM to help you do a fast, safe job. CARBOFLEX Depressed Center Wheels are strongly reinforced for complete operator safety, yet give you an *extra-high rate of cut.*

Here are some typical jobs where CARBOFLEX Depressed Center Wheels have proved their superiority: under-cutting and reducing heavy welds, cleaning castings, roughing off fins and sharp edges, notching and cutting off gates and risers, removing surface defects, and general purpose roughing, slotting and cutting off.

An exclusive feature of the CARBOFLEX Depressed Center Wheel: the back, as well as the face, is knurled. You can cut with either side plus the edge, without initial dressing.

The right combination of tough, top-quality abrasive grain and a strong, reinforced bond is what makes CARBOFLEX Wheels so effective. Tough, durable CARBOFLEX Depressed Center Wheels combine extreme high strength and resistance to cracking with maximum cutting ability... the only combination that gives you more production per wheel at less abrasive cost.

Use CARBOFLEX Depressed Center Wheels on your toughest jobs. You'll be more than pleased with the results!

● **OUR DISTRIBUTOR OR SALESMAN** is ready to demonstrate this new cost-cutter. He's listed in the yellow pages of your telephone directory—under "Abrasives" or "Grinding Wheels." Call him... or, if you prefer, write to The Carborundum Company, Dept. F 81-41, Niagara Falls, N. Y.

CARBORUNDUM

REGISTERED TRADE MARK

81-41

IRON AND STEEL SHOPS SAVE WITH TRULINE®

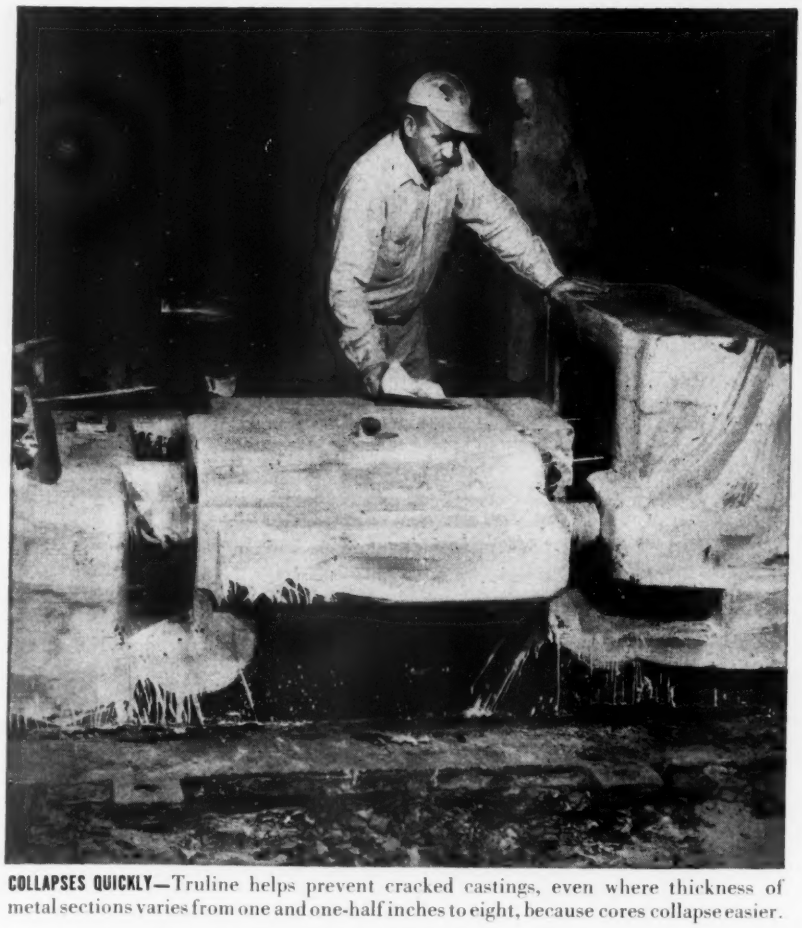
Today's accent on economy offers foundrymen convincing reasons why they should use Truline Binder in core sands. Savings in both man-hours and material costs are obtained in producing quality castings.

Iron shops using Truline for gravel and black sand cores report as high as 50 per cent reduction in shake-out and baking time. The high baked strength tends to eliminate core breakage. In some cases, iron foundries have successfully used Truline in a mixture of half heap sand with new, for medium and large core work.

Truline gives faster and more uniform baking—smoother, cleaner casting surfaces. Steel shops report its high efficiency in core facing sands, backing sands, and pouring cup mixes. Truline is equally effective for skin dry and dry sand molds. It has high resistance to moisture pickup.

Let us give you the up-to-date story on how Truline can help you save time and money.

BAKES OVERNIGHT—Iron shops solve baking bottlenecks by using Truline. This core was baked thoroughly in one night at 400°F.—halving the time required with other binders.



COLLAPSES QUICKLY—Truline helps prevent cracked castings, even where thickness of metal sections varies from one and one-half inches to eight, because cores collapse easier.

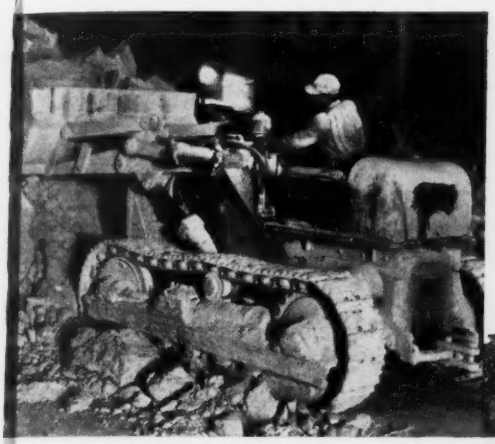
Naval Stores Department
HERCULES POWDER COMPANY
INCORPORATED
920 King St., Wilmington 99, Delaware

NF54-2

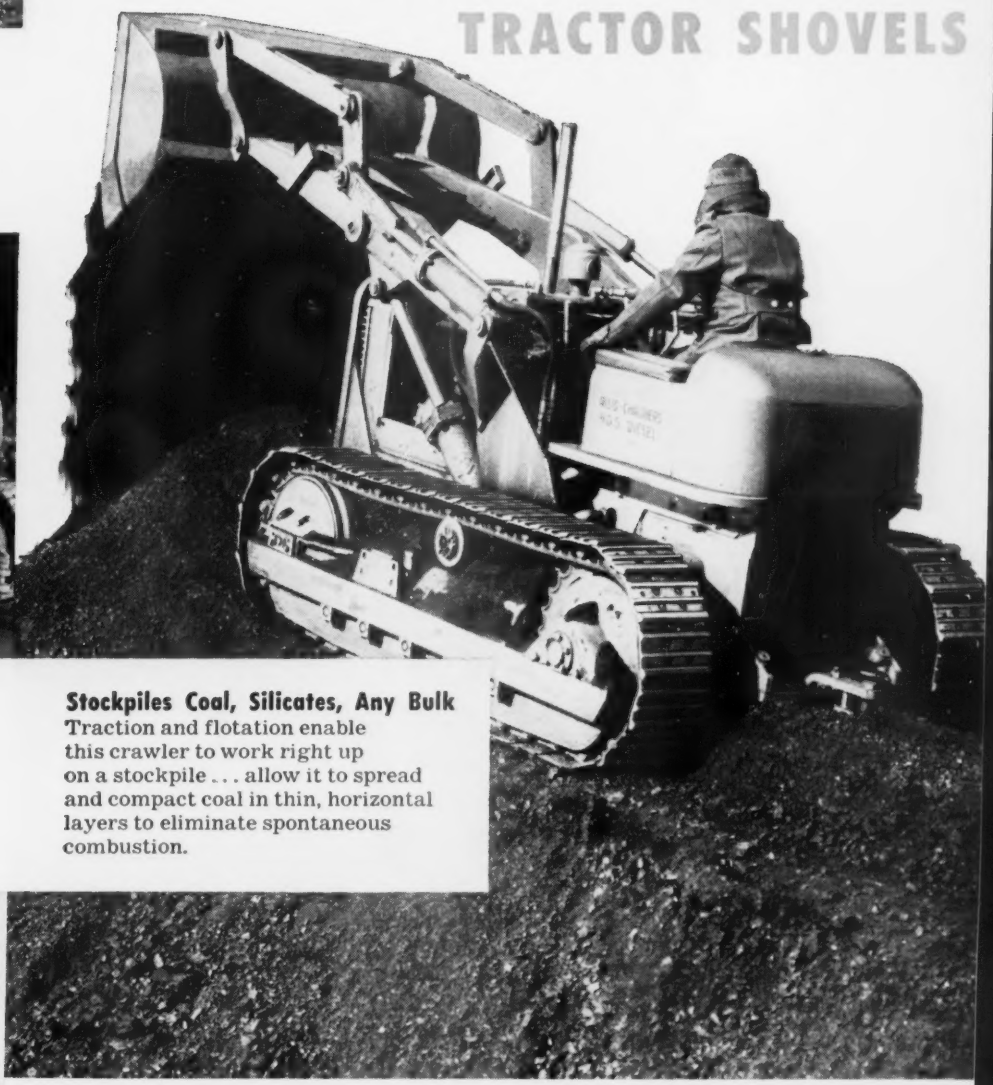
New Trends in Mechanized Materials Handling

WITH ALLIS-CHALMERS TRACTOR SHOVELS

Feeds Hoppers, Conveyers
Special high-speed reverse increases output on short runs between stockpile and hopper. Steel tracks stand up in cullet and other sharp, abrasive material.



Excavates, Loads Trucks
This busy crawler-mounted shovel has the power to dig into hard-packed materials — and bring it out, a full cubic yard at a scoop. In handling light materials, an interchangeable two-yard bucket doubles its capacity.



Stockpiles Coal, Silicates, Any Bulk
Traction and flotation enable this crawler to work right up on a stockpile . . . allow it to spread and compact coal in thin, horizontal layers to eliminate spontaneous combustion.

Handles Packaged and Solid Materials
With Lift Fork in place of bucket, the HD-5G skids, carries and stacks palletized loads weighing up to 4,000 lb. Stacking height beneath forks is 106 inches.

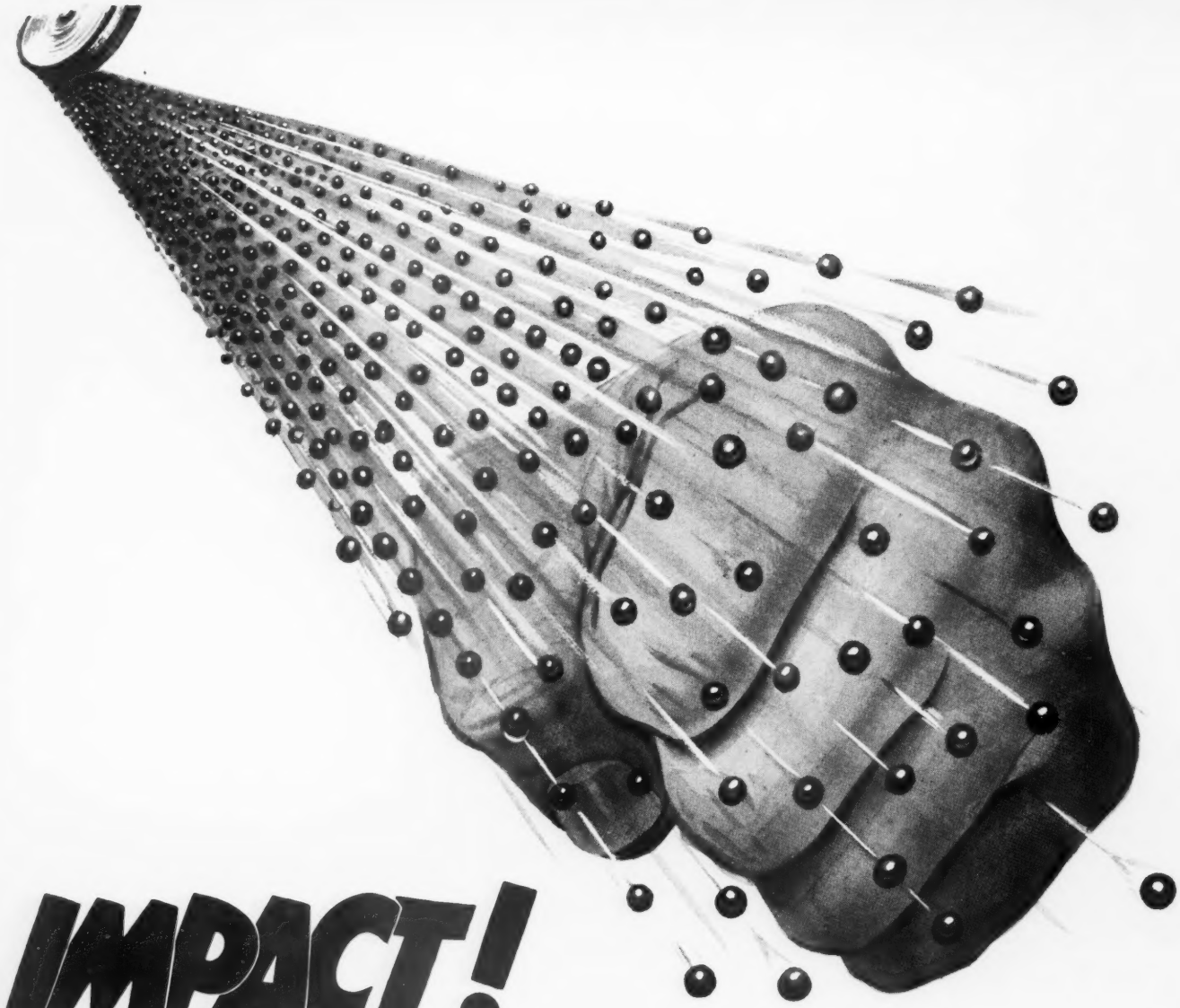
Crawler tractors — basic machines on earth-moving and construction jobs — are now solving more and more bulk materials-handling problems in industry with hydraulic front-end shovels. And spear-heading this new trend is the Allis-Chalmers HD-5G — thousands of which are now in use in plants of all types. This multi-purpose crawler combines power, traction and maneuverability with a wide selection of hydraulically operated attachments for a variety of material handling jobs.

Get the full story on how crawler tractor power and versatility can help mechanize your tough jobs. Ask your Allis-Chalmers dealer about the HD-5G and these three larger tractors shovels: 2-yd. HD-9G, 3-yd. HD-15G and 4-yd. HD-20G. Light materials buckets range from 2 to 7 cu. yd.

ALLIS-CHALMERS
TRACTOR DIVISION — MILWAUKEE 1, U. S. A.

Here are a few of the other jobs the HD-5G and its attachments will handle:

Maintains yards and roads with bulldozer or shovel • Clears snow from parking areas • Moves machinery and other heavy materials with Crane Hook attachment • Spots railroad cars at loading docks • Digs trenches for pipe or foundation footings with Trench Hoe attachment



IMPACT!

MALLEABRASIVE . . . SHOT OR GRIT . . . is *packed* with blast cleaning power for profitable operation.

Because Malleabrasive is scientifically heat-treated and laboratory-controlled it does a *better, faster* cleaning job. And because it cleans quicker, lasts longer, saves you parts repairs and downtime—Malleabrasive means *cheaper cleaning.*

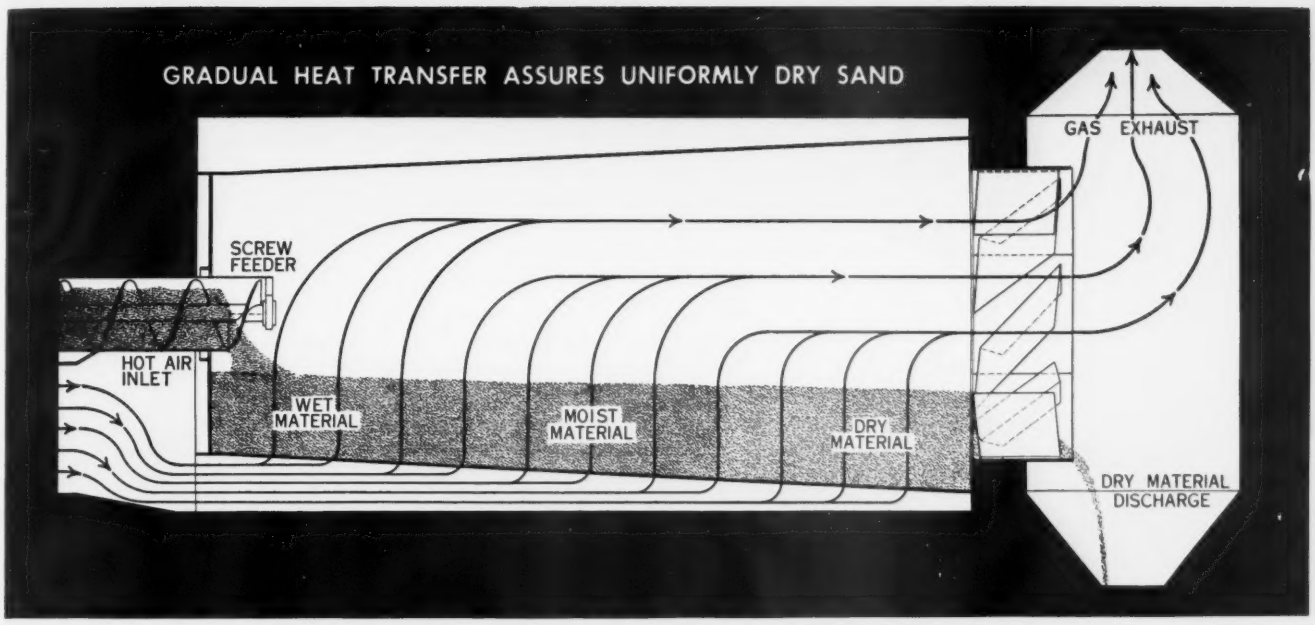
Words won't prove it—the final test is in *your* equipment. Try Malleabrasive on your jobs and see for yourself. Next time you order blast cleaning abrasive, specify Malleabrasive from PANGBORN CORP., 1400 Pangborn Blvd., Hagerstown, Md.

Pangborn DISTRIBUTORS FOR

MALLEABRASIVE®

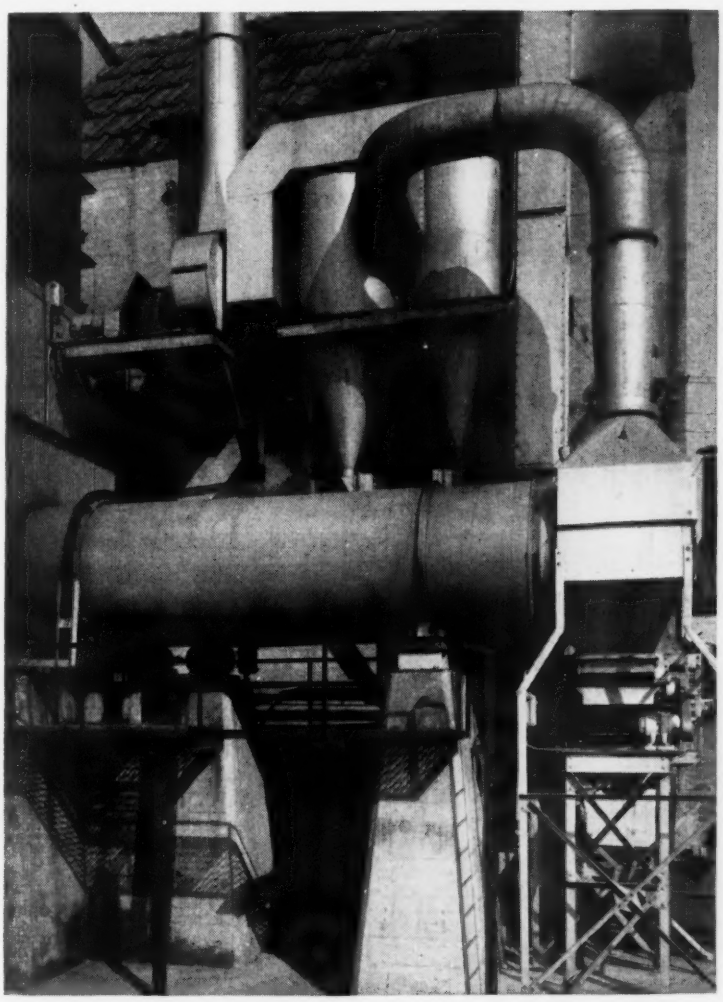
PANGBORN'S 50th ANNIVERSARY—1904-1954

*U. S. Patent #2184926
(other patents pending)



Gentle rolling action over slowly revolving louvres results in uniform treatment, thereby eliminating spotty over- or under-drying. Gradual drying of sand, as it progresses through the Roto-Louvre Dryer, affords a uniform moisture content of the product at a low final temperature.

Dry sand means better castings



At a Detroit automotive foundry, Link-Belt Roto-Louvre Dryer reduces moisture content of 10 tons of sand per hour from 6.0% to 0.5%.

Space-saving LINK-BELT Roto-Louvre Dryer delivers large volumes of dry sand... at cool discharge temperatures

For uniform mixing, core and molding sands must be dry. And the sand must also be cool enough to blend properly with core oil. On both counts, Link-Belt Roto-Louvre Dryers offer unique advantages.

Sand is delivered with a uniform moisture content of 0.5% and at a uniformly low discharge temperature. Equally important, Roto-Louvre does this without the assistance of an extra cooler . . . requires only half as much floor space as other drying equipment.

Link-Belt builds eight sizes of Roto-Louvre Dryers—in capacities from 1 to 60 tons per hour. Get complete information from the Link-Belt office near you, or write direct for new Book 1911-B.

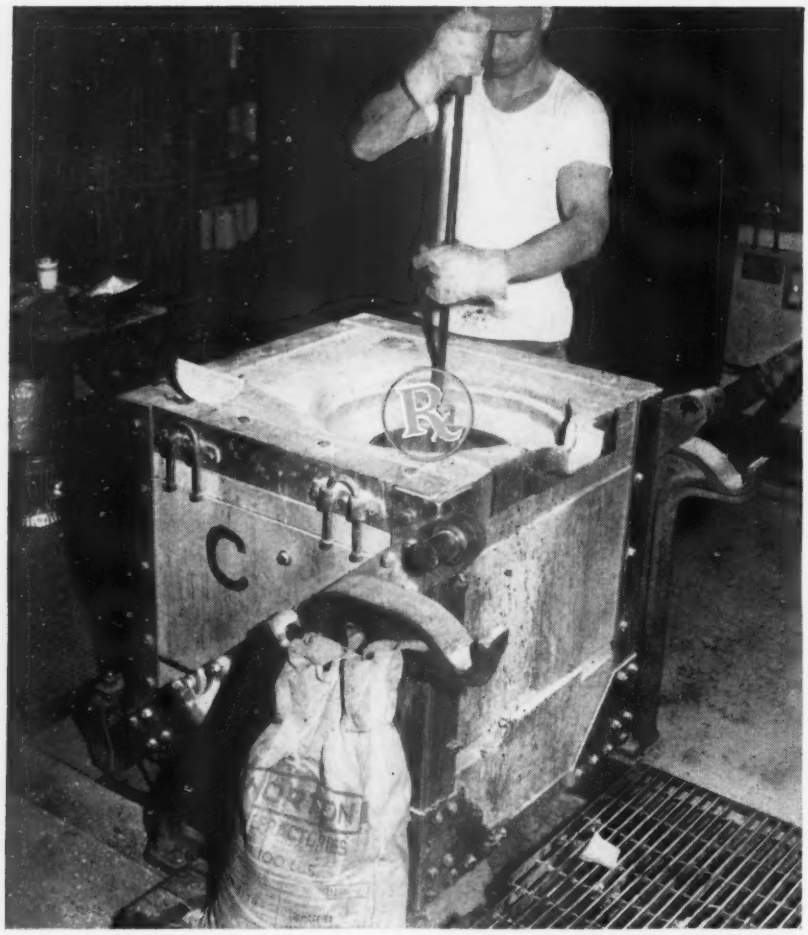
FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

LINK-BELT

HANDLING and SAND PREPARATION MACHINERY

LINK-BELT COMPANY Plants: Chicago, Indianapolis, Philadelphia, Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales Offices in Principal Cities. 12.949

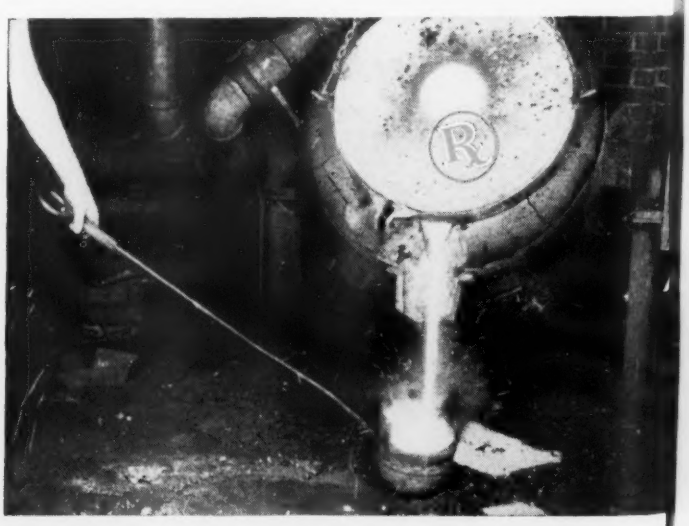
Rx for



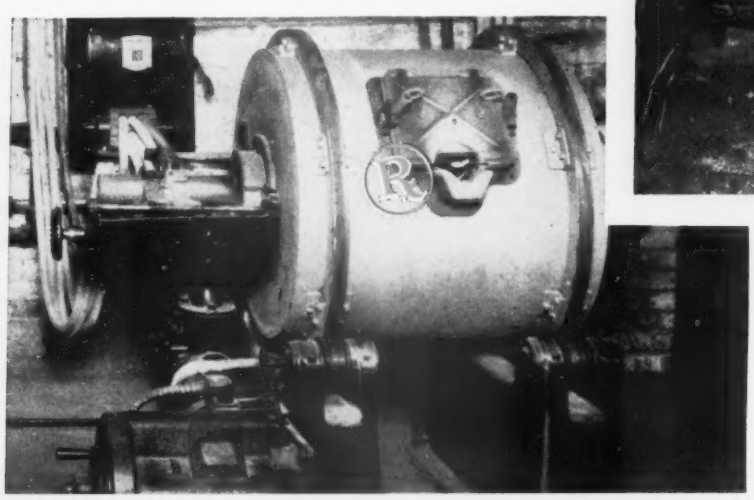
For High Frequency Furnaces. Norton MAGNORITE cement has been especially engineered for dry ramming and for withstanding temperatures up to 3250°F. Also, its slight expansion on maturing eliminates shrinkage cracks which might lead to furnace failure. It's the ideal prescription for lining high frequency induction furnaces handling melts of high temperature alloys.

Other Norton refractories for high frequency furnaces include FUSED STABILIZED ZIRCONIA crucibles for melting platinum and its alloys. They are not wetted by the metal, enabling you to recover 100% of the melt without destroying your crucibles, or to re-use the crucibles for different alloys without contamination.

For Low Frequency Furnaces. The furnace shown here has a special MAGNORITE cement lining. ALUNDUM cement is also widely used in low frequency induction furnaces. Whatever you're melting, including such refractory alloys as cupronickel and nickel silver, high copper alloys and Al, Te and Si bronzes, one of these two Norton Rx's is engineered to give you longer lining life — plus the high rammed density that resists metal penetration, erosion and chemical attack.



For Crucible Type Furnaces. The cover of this tilting crucible furnace and its cement lining are both made of CRYSTOLON refractory material, engineered for the user's particular needs. CRYSTOLON linings offer effective protection against flame erosion and thermal shock.



For Indirect Arc Furnaces. This installation owes much of its high production rate to its lining of correctly-engineered ALUNDUM cement. More and more foundries report excellent results with ALUNDUM and MAGNORITE crocks, covers and cements — engineered and prescribed for their individual metal processing needs. Norton prescriptions will save *you* time, trouble and money, too!

higher production . . .
better products . . . lower costs

Norton refractories are engineered for top performance—prescribed for many metal processing applications

Norton refractory products are *engineered* to give you the best possible Rx's — the most effective combinations of physical, chemical and thermal characteristics — for your particular refractory uses.

Norton ALUNDUM*, CRYSTOLON*, MAGNORITE* and FUSED STABILIZED ZIRCONIA refractory materials are made into shapes and cements to meet your requirements. For the Rx's *you* need to improve your processing — and for expert aid in any refractory problem — call in your Norton Refractories Engineer. And write for helpful literature to NORTON COMPANY, 305 New Bond Street, Worcester 6, Mass. *Canadian Representative:* A. P. Green Fire Brick Co., Ltd., Toronto, Canada.

NORTON

REFRACTORIES

Engineered . . . Rx . . . Prescribed

Making better products . . . to make other products better

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

Other Norton Prescriptions

are helping metal processing plants to maintain schedules with minimum shut-downs. For example:

Heat-Treating And Sintering Furnaces operate at higher temperatures and lower costs, thanks to a wide variety of ALUNDUM and CRYSTOLON refractory products. Hearth plates, pier brick, burner blocks, muffles, muffle plates, skid rails, recuperator tubes, burner-tunnel and embedding cements combine high refractoriness with excellent thermal conductivity and resistance to spalling, erosion and corrosion.

Desulphurizing Ladles which require addition of sodium carbonate gain consistently longer lining-life when ALUNDUM cement is used. One gray iron foundry, using a 1500-lb. U-type ladle reports that ALUNDUM cement lasts two to four times longer than other linings, month in and month out.

Steel Ladles show equally successful results when lined with ALUNDUM cement. One plant, using it in a 1000-lb. teapot ladle to handle stainless steel, stepped up the number of heats from 47 to 103.

For Cupola Type Furnaces. For back slagging cupolas, the Norton Rx is CRYSTOLON slag hole blocks, as shown. For capping the notch and lining the slag chute in front slagging cupolas, CRYSTOLON bricks and cement are prescribed. This refractory material is engineered to give exceptionally long service life at temperatures up to 3050°F. It has great resistance to slag penetration and chemical attacks—and 5 to 15 times the resistance of ordinary fire clay to erosion and corrosion.

For Reverberatory Furnaces. The Rx for this reverberatory furnace is Norton CRYSTOLON refractory cement, engineered for maximum service life of this particular metal-melting job.

For Electric Furnaces. Furnace equipment of this type operates at lowest performance and maintenance costs when CRYSTOLON heating elements — Norton "Hot Rods" — are installed. They're the newest Norton Rx, engineered and prescribed for electric furnaces. They can be used to replace your present rods — and have proved their ability to deliver two to four times longer service life. Ask for our special booklet on CRYSTOLON "Hot Rods" for all applications.

Here's how to cut your casting costs . . .

Photo courtesy of METCO PROCESSING CORPORATION

Up to 50% closer dimensional tolerance . . . 60% less time . . . 14% increase in metal yield . . . 300% increase in production rate . . . 25% less initial plant cost . . . 80% reduction in machining operations . . . these are some of the almost unbelievable gains being made in some of the nation's leading foundries by the shell molding process.

Experienced foundry men know that the quality of the resin has a great deal to do with the degree of savings achieved with shell molding. This is why more foundries are specifying Monsanto Resinox shell molding resins as the shortest and most profitable road to castings with better surface finish, greater uniformity, much lower reject rate, more accurate dimensions and lower cost. Resinox shell molding resins, like all Monsanto foundry resins, are research-proved and shop-tested under actual foundry conditions. They are designed to meet your production requirements.

In addition to Resinox shell molding resins, Monsanto supplies phenolic and Resimene urea resins for core binding, and Lytron sand conditioner for conventional sand casting. For complete information, mail the handy coupon today.

Resinox: Reg. U. S. Pat. Off.

MONSANTO CHEMICAL COMPANY, Plastics Division, Room 5705, Springfield 2, Mass.

Please send me complete information on:
. . . Resinox shell molding resins; . . . Monsanto phenolic resins; . . . Monsanto core binding resins; . . . Lytron sand conditioner.

Name & Title _____

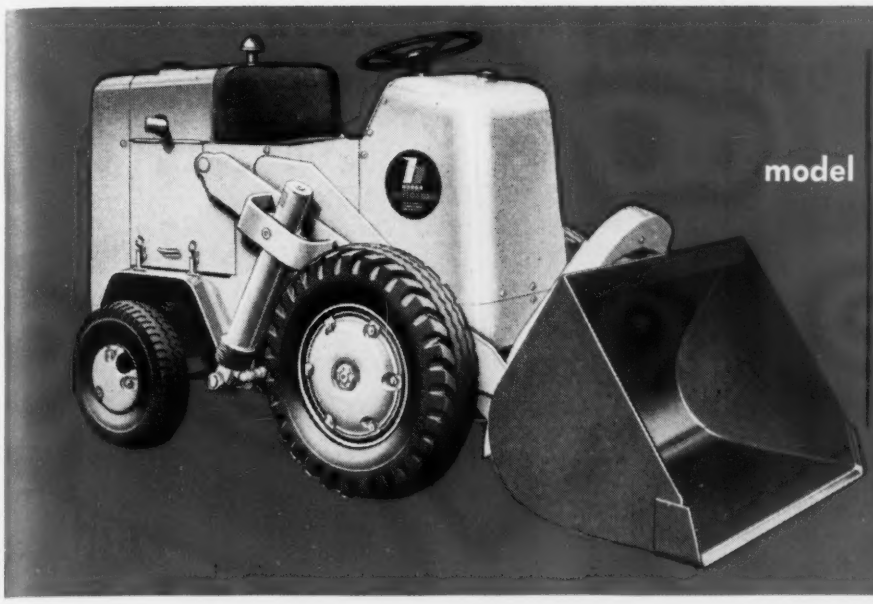
Company _____

Address _____

City, Zone, State _____

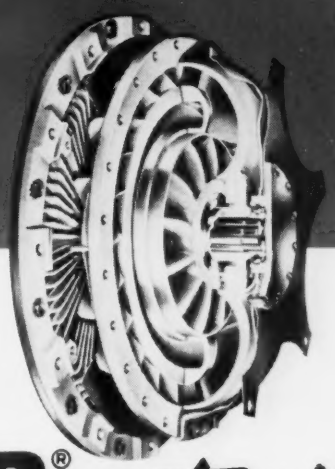
MONSANTO

SERVING INDUSTRY . . . WHICH SERVES MANKIND



model **HAC**

(CAPACITY: 16 cu. ft. Payload; 12 cu. ft. Struck)
Torque-converter drive now standard. Gas or diesel.



New Torque Converters boost PAYLOADER® *output*

For faster, more economical bulk-materials handling

Here's good news to the users of *"PAYLOADER"* tractor-shovels. These two popular models now include torque-converter drive as standard equipment! Extensive testing of both units shows that new peaks of performance are provided. Prove to yourself that these two famous *"PAYLOADER"* tractor-shovels are still the finest in their class. Ask your *"PAYLOADER"* Distributor for a demonstration, or write The Frank G. Hough Co., 703 Sunnyside Avenue, Libertyville, Illinois.

Greater Output — because machines operate at highest speed in relation to load.

Lower Upkeep — because the oil cushion absorbs load shocks and because clutch life is greatly increased.

Easier Operation — because much gear-shifting and "clutching" are eliminated.

More Efficiency — because engine operates at most efficient speeds and without laboring or stalling.

YOU CAN'T COMPETE IF YOUR EQUIPMENT IS OBSOLETE!

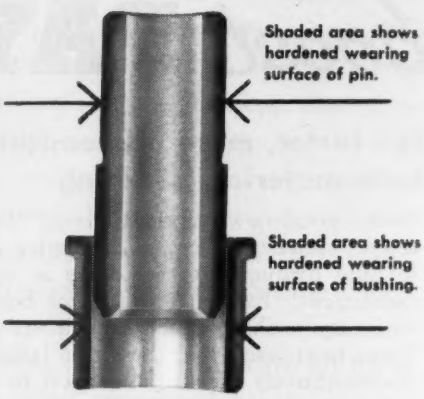
SAY "HUFF" **PAYLOADER®**
THE FRANK G. HOUGH CO. • Since 1920

model **HAHC**

(CAPACITY: 24 cu. ft. Payload; 18 cu. ft. Struck)
Torque-converter drive and power-steering now standard.

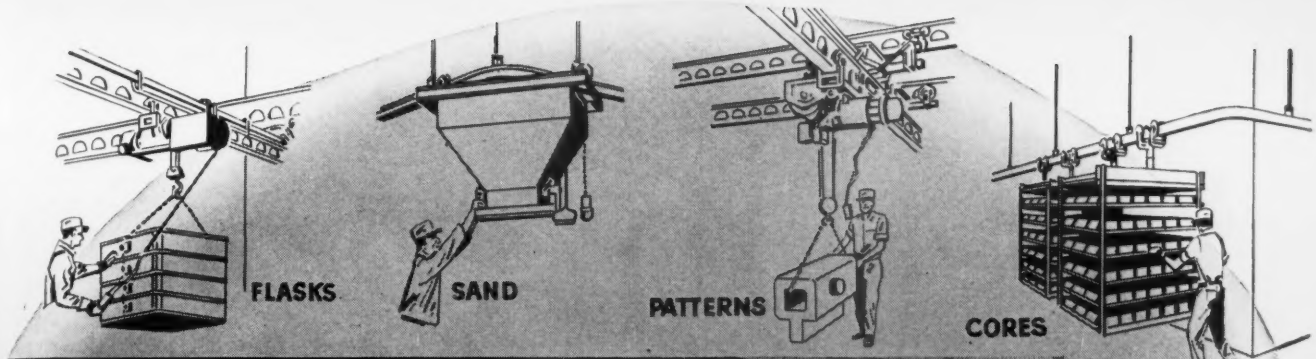
carburized and hardened wearing surfaces increase life of UNIVERSAL flask pins and bushings

The wearing surfaces of Universal flask pins and bushings are carburized and hardened so they can take long, rigorous wear and rough treatment in the foundry. Both pins and bushings are double quenched and double drawn to produce strong ductile cores with a fine grain structure that will withstand considerable stress and strain without breaking. Universal flask pins and bushings are precision ground to extremely close tolerances to insure instant, accurate alignment of cope and drag. Plain, taper, round, hexagonal and threaded series pins and bushings are available in a complete range of sizes as regular stock items. For complete information, write to the office nearest you — Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wisc., or the home office.

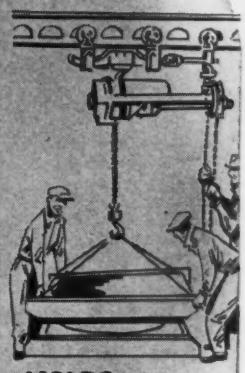


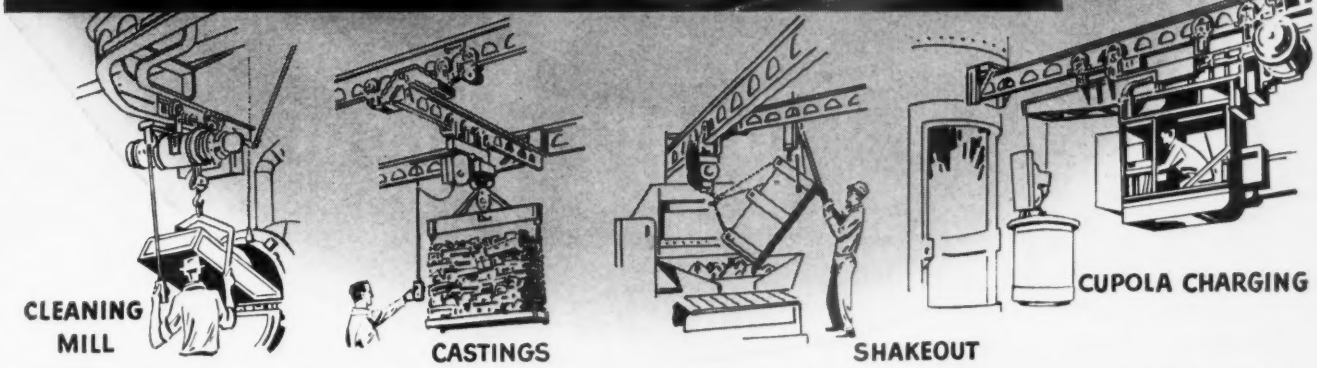
184

UNIVERSAL ENGINEERING COMPANY FRANKENMUTH 4, MICHIGAN



Versatile Cleveland Tramrail Speeds Every Foundry Operation





Wherever materials must be lifted and moved, Cleveland Tramrail overhead materials handling equipment can save time, make the work easier and safer, speed production and cut costs.

Because 150 to 250 tons of various materials must be handled to produce a ton of finished castings, foundries find Cleveland Tramrail particularly advantageous. In many cases the use of Cleveland Tramrail means the difference between profit and loss. Because it affects the price of the finished product so greatly, it will be a key factor for numerous foundries in obtaining orders during periods when the competitive situation is keen.

Talk over your foundry handling with a Tramrail engineer. A nearby representative will be glad to visit you without obligation.

GET THIS BOOK!
BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
3835 EAST 286th ST. WICKLIFFE, OHIO

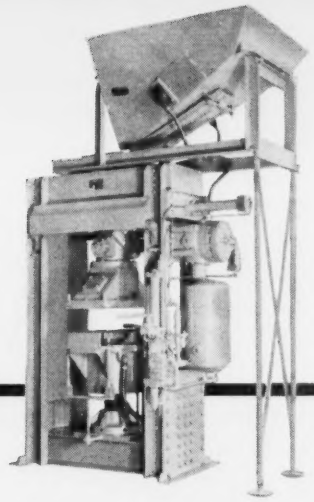
CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

4 *good reasons why*

FOUNDRIES LOOK TO DEMMLER FOR CORE BLOWERS!

It was in 1909—44 years ago—that Demmler first introduced the core blower. It was only natural that when foundries encountered special core blowing problems they turned to Demmler engineers—the pioneers in the field. Year after year, Demmler has consistently led with "firsts" in core blower design. The four machines at right are four good examples of this leadership. When you have a problem and need a specially designed core blower that is tailor-made for your particular operations, call in a Demmler engineer. There's no obligation.

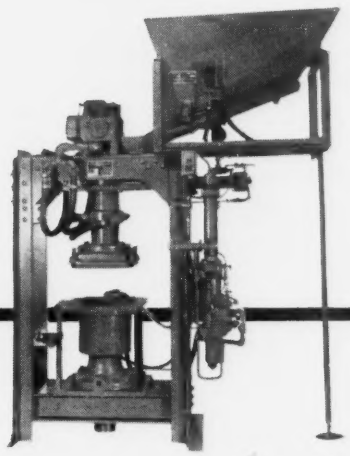
Model 103 CORE BLOWER



DEMMLER *Model* 100 Series CORE BLOWERS-Available in four sizes

A number one reason for Demmler leadership. The Demmler 100 Series was designed for fast operation on defense project where it was necessary to blow 2,000 cores per hour! Now it is available for faster core blowing in your foundry. Stationery magazine type core blowers capable of blowing ANY core or molding sand.

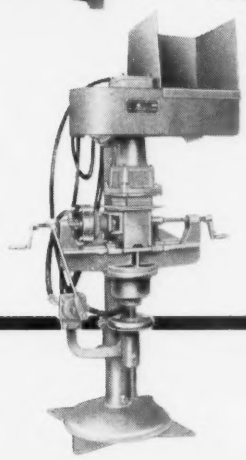
Model 1E-OS CORE BLOWER



DEMMLER *Model* 1E-OS CORE BLOWER

This core blower is another production pace setter. It can be used with two drag halves so the operator can remove one core while the second core is being blown. Double production because there is no waiting! One push of the starting lever and the machine automatically completes one cycle and the magazine returns to filling position. Write for information about this production-worthy Demmler 1E-OS.

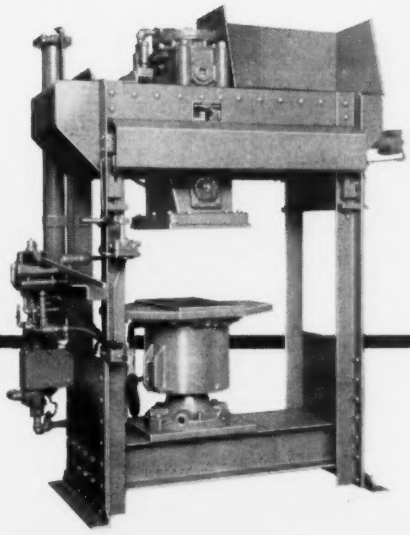
Model 55 CORE BLOWER



DEMMLER *Model* 55 CORE BLOWER

This little giant is unequalled among competitive core blowers for fast, economical production on short run jobs. The Demmler 55 has one hand valve that operates both vertical and horizontal core box clamps and blows the core—in only 3 seconds! Used for core boxes with depths up to 10″, handles cores up to 4 lbs. A wide range of sand magazine bottom openings available to meet all your core box dimensional requirements.

Model 2E CORE BLOWER



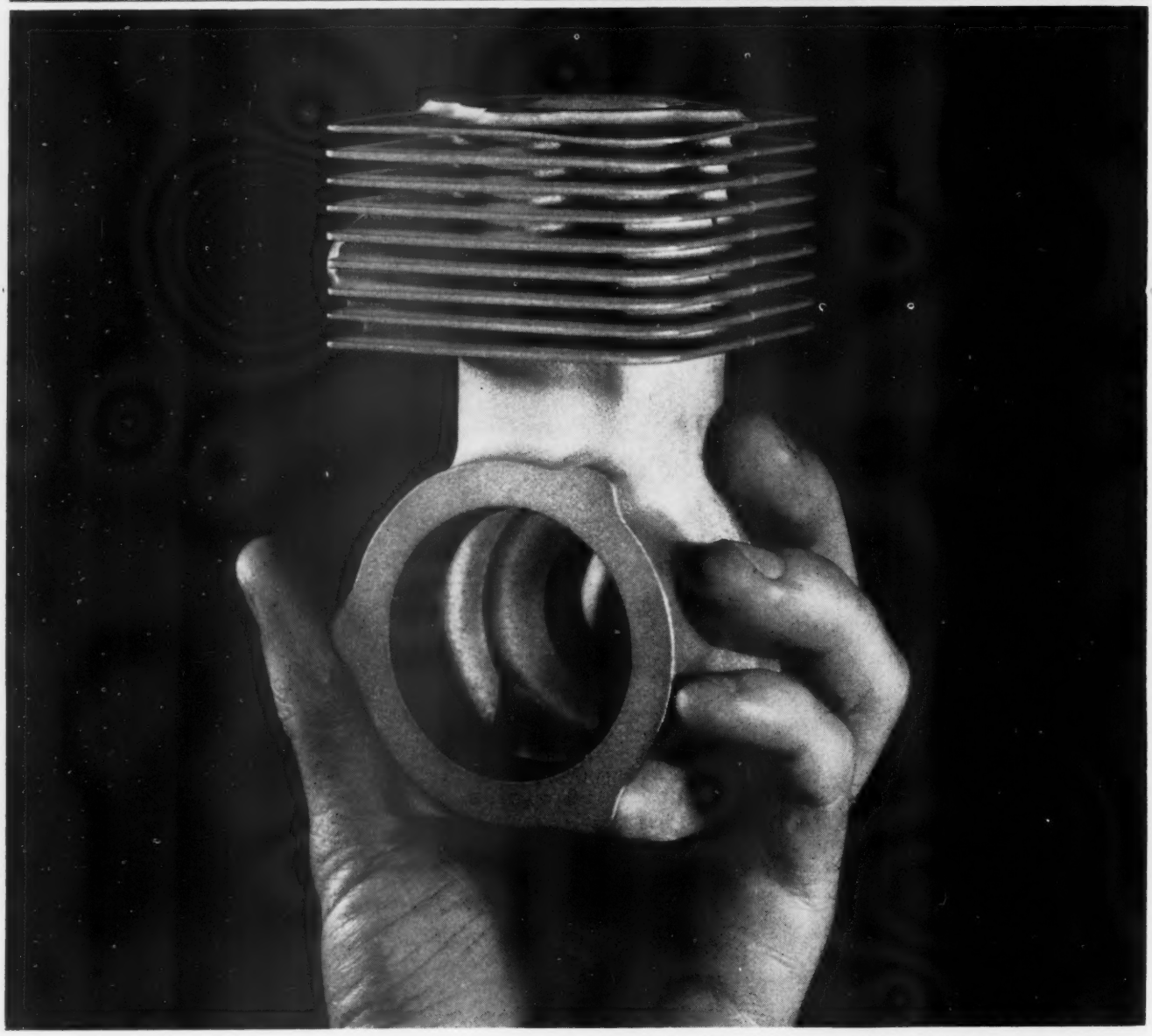
DEMMLER *Model* 2E CORE BLOWER

Built for rugged service without maintenance troubles. The Demmler 2E handles cores up to 20 pounds. Available with manual, semi-automatic or fully automatic controls. The draw cylinder is 14″ in diameter and the machine has a 10″ stroke. The drawing post is completely enclosed and protected from sand and abrasion to guarantee accuracy and trouble-free operation. Ultra high speed blow valve action increases initial blow pressure 25%.

All models of Demmler Core Blowers can be furnished with vibratory sand feeders as shown above on the 100 series and the 1E-OS.

WRITE FOR LITERATURE • WM. DEMMLER & BROS. • Kewanee, Illinois

A PRODUCT OF FOUNDRY SKILL AND *Borden's* SHELL-MOLD RESIN



Casting by BLACKHAWK FOUNDRY AND MACHINE CO., Davenport, Iowa

Shell molding makes this possible

Look closely at this shell casting for a tiny gasoline motor cylinder. There are 9 fins in a 1½" space... all smooth and sound. The entire casting has a micro finish. Rough cuts have been eliminated. The exceptional accuracy of the casting assures easy set-up for finish machining.

It is virtually impossible to produce castings with these specifications in green sand molds. With shell molds, castings such as this become routine production items.

The high speed, automatic shell-molding process also provides greater flexibility in mold production schedules and savings in foundry space, time and sand-handling costs.

Borden Foundry Engineers will be glad to help you adapt the shell-mold process to your needs. Address: The Borden Company, Chemical Division, Dept. F-64, 350 Madison Avenue, New York 17, New York.

FOUNDRY PRODUCTS DEPARTMENT

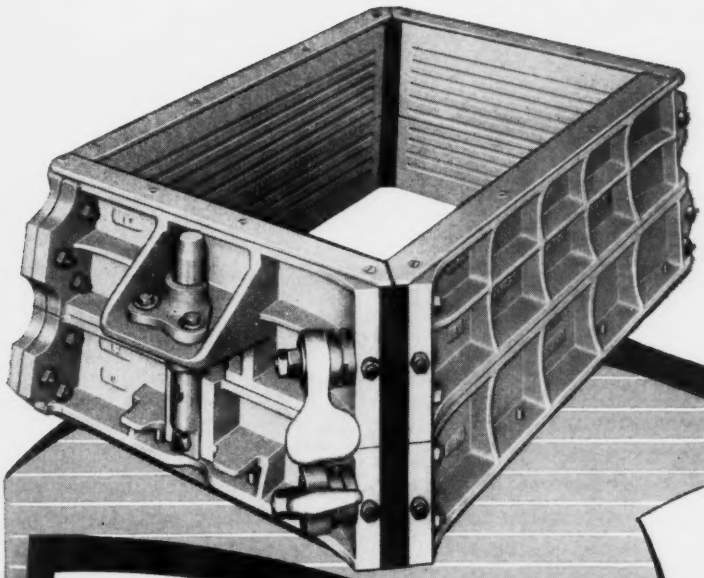
THE BORDEN COMPANY

Chemical Division

A CENTER OF ATTENTION

at the Foundry Congress

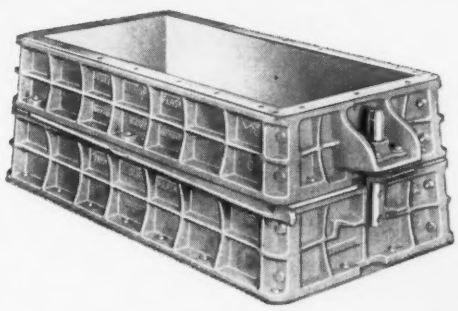
FREMONT SPREADLOCK FLASKS



No sand can lodge in the open corners of Spreadlock flasks. The corner gaps are completely closed by long-life, easily replaceable, live rubber inserts. Made of magnesium, which has twice the tensile strength of aluminum, they afford much longer service and are easier to handle. Accurately machined inside surfaces and flanges, and steel-faced top and bottom flanges assure more exacting work.

PERFECT ALIGNMENT INDEFINITELY!
Guaranteed by the one-inch GROOVLOCK FOOLPROOF PIN on

FREMONT STANDARD SLIP FLASKS



Particularly adapted to cope or drag pattern jobs. Solid, bolted and welded corner construction. Other types of standard pin fittings available.

SAVE BIG MONEY!
The precision machined and drilled, bolted corner construction of

FREMONT CAST IRON OR CAST ALUMINUM JACKETS

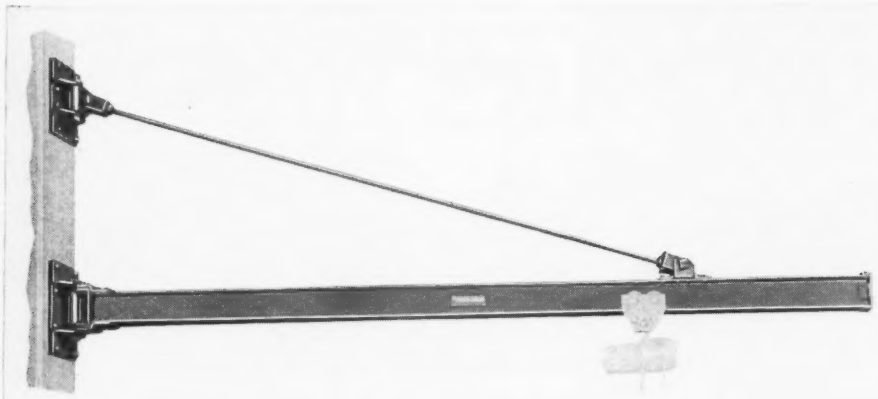
permits easy insertion of new sides or ends. Entire jacket need not be scrapped. The standard style is designed for ordinary foundry practice, the grooved style, which permits ready gas escape, is ideal for steel foundries. Flasks and jackets can be assembled on 3°, 4° or 5° taper.

Write today for free literature and prices. All orders given prompt attention.

THE FREMONT FLASK CO.
Fremont, Ohio

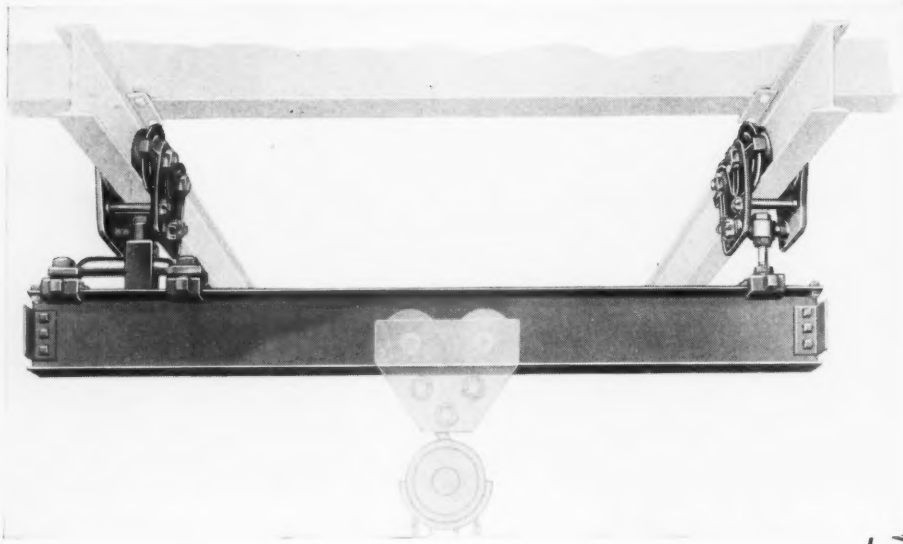
Small foundries choose

Richards-Wilcox Cranes



#939 Swinging Jib Crane

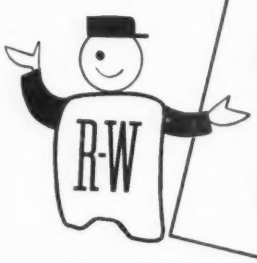
Simplicity of design makes this crane inexpensive and economical to install. Most commonly used with the rod support (above) but is also available with curved track for supporting outer end of boom. Available in a variety of sizes with capacities up to 4000 lbs.



#971 Flexible Traveling Crane

Simple in construction but extremely flexible in operation. Yoke and cross-head (shown at left end of crane bridge) are self-adjusting to variations in track width, permit economical installation because accurately straight I-beam runways are not required. Crane cannot bind because bridge need not maintain right angle to tracks. Not suitable as a transfer crane. Available in many sizes with capacities up to 8000 lbs.

You don't have to be BIG to be efficient! Richards-Wilcox Cranes, No. 939 and No. 971 are designed to give better, lower cost performance in small foundries. Simplicity of design makes them inexpensive, easy and economical to install, while maintaining the highest standards of quality. R-W Cranes are typical of the many *quality* products made by Richards-Wilcox to help bring greater efficiency and lower costs to small space production.



Quality engineered for better performance

1880 RICHARDS WILCOX R-W AURORA TRADE MARK Reg. U. S. Pat. Off. 1954

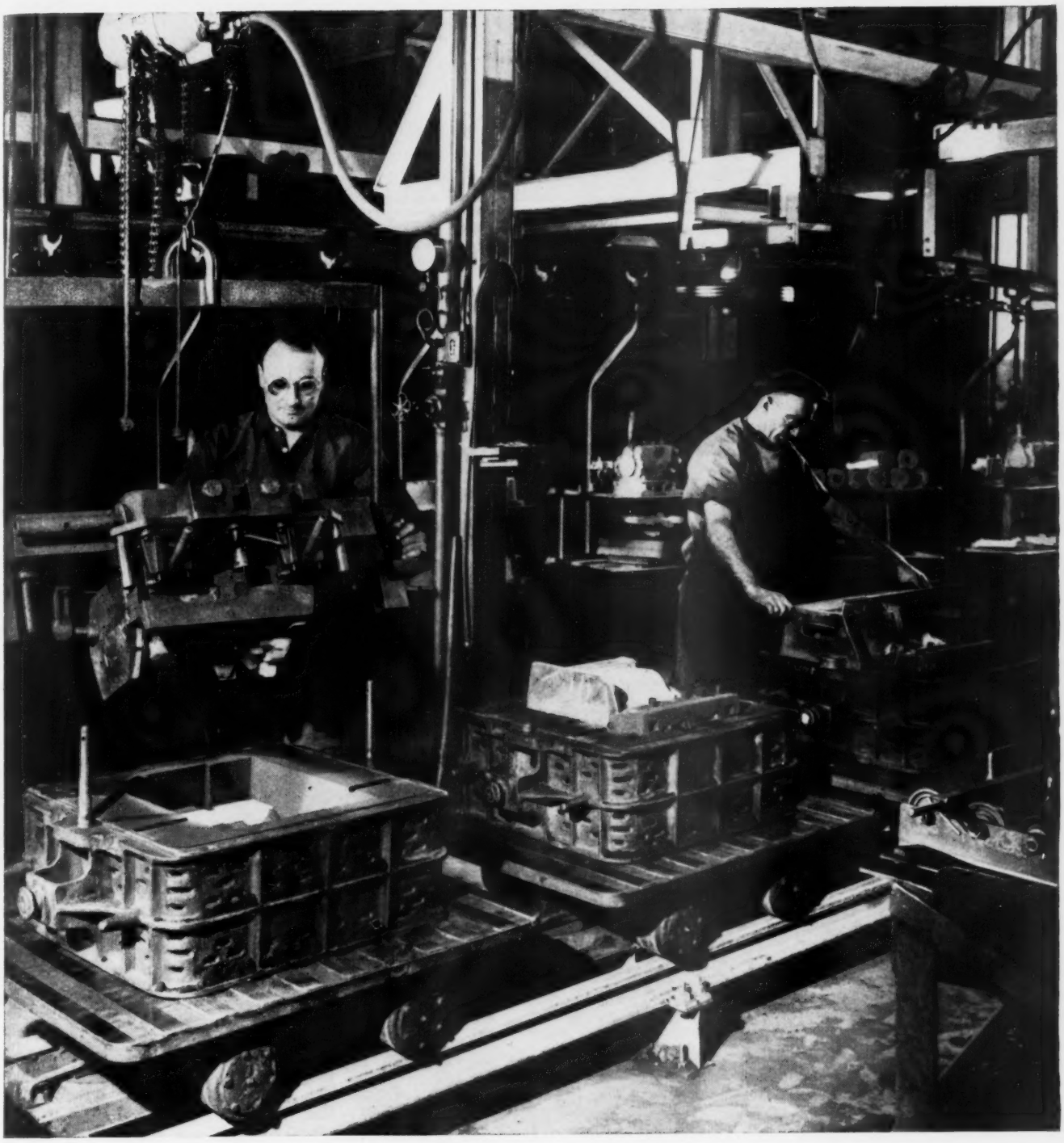
SLIDING DOOR HANGERS & TRACK • FIRE DOORS & FIXTURES • GARAGE DOORS & EQUIPMENT • INDUSTRIAL CONVEYORS & CRANES • SCHOOL WARDROBES & PARTITIONS •

Richards-Wilcox Mfg. Co.

"A HANGER FOR ANY DOOR THAT SLIDES"

Branches in Principal Cities

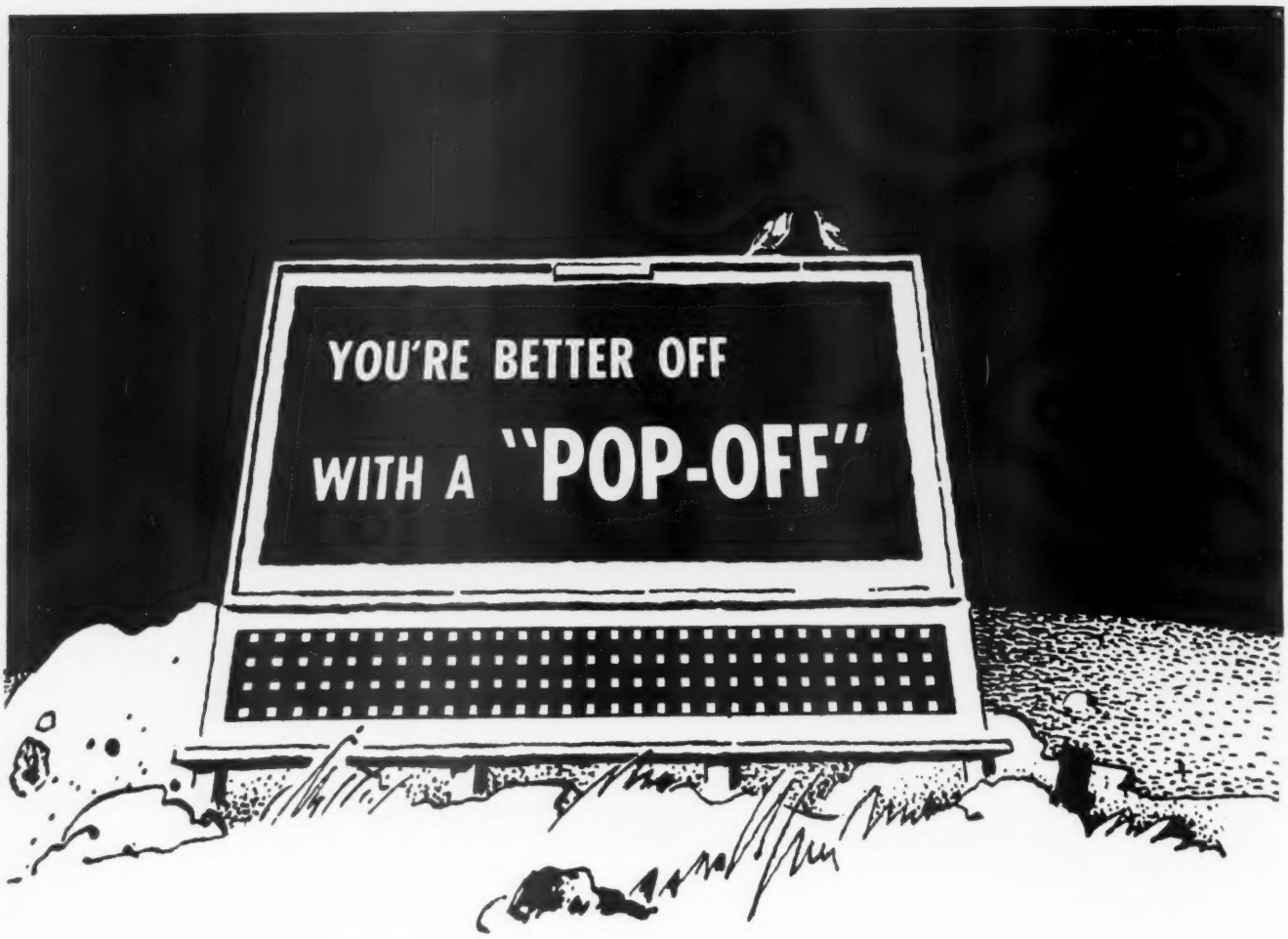
320 W. THIRD STREET, AURORA, ILLINOIS



COMPLETE FOUNDRY ENGINEERING SERVICE

Basic Layouts — Equipment Installation Designs — Production Analyses — Equipment Design and Specifications — Purchase Recommendations — Fume, Smoke and Dust Control — Architecture — Process Piping — Power Distribution — Heating and Ventilating — Specifications and Contracts

GIFFELS & VALLET, INC.
INDUSTRIAL ENGINEERING DIVISION
1000 MARQUETTE BUILDING, DETROIT



you hear it from foundrymen everywhere!

HINES POP-OFF FLASK

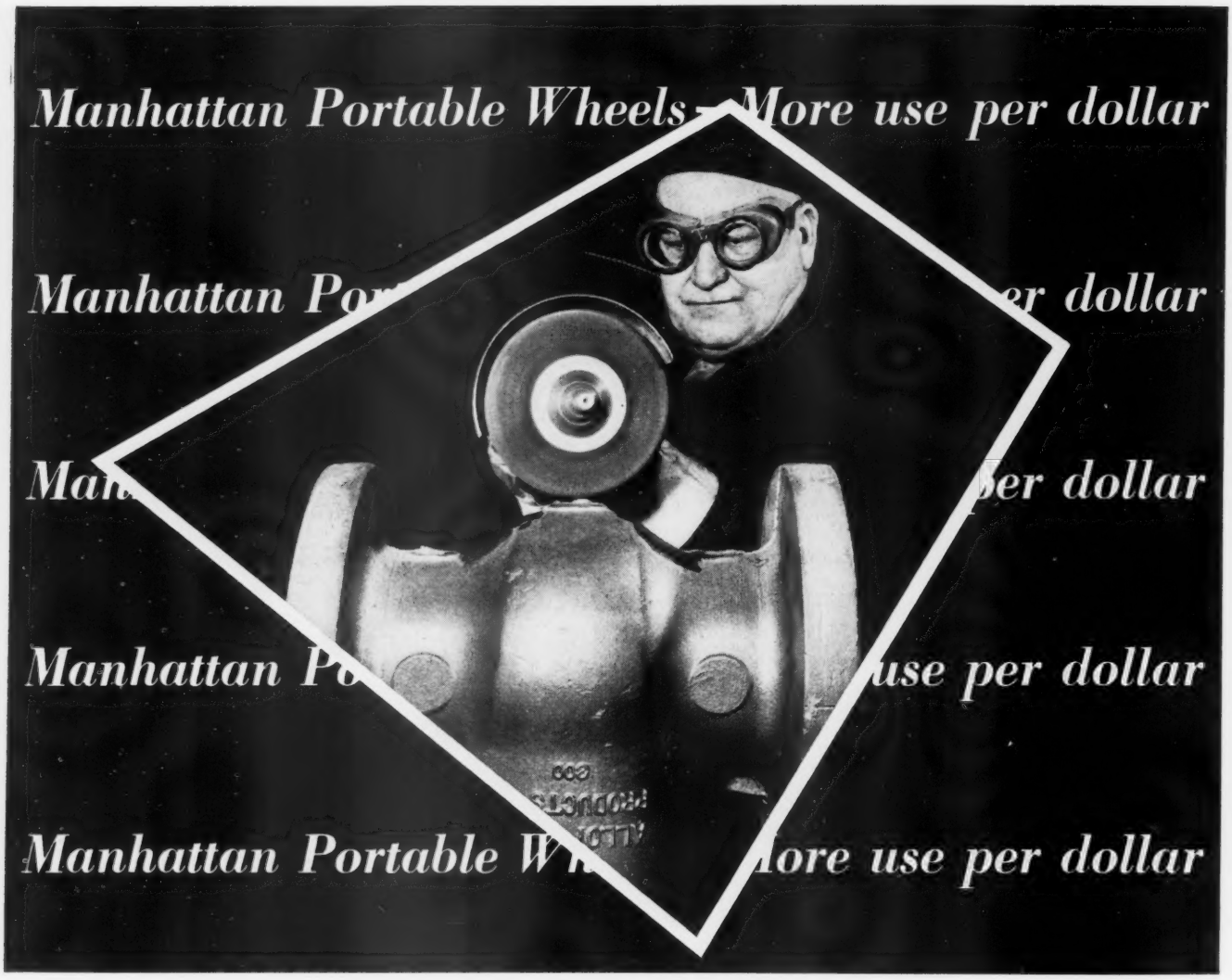
MEMBER FEMA

THE

HINES aluminum "Pop-Off" flask, the most highly developed—most efficient flask of its type. Gives better and longer service simply because it's made better and stronger. Lasts longer, too, because hammering isn't necessary for removal—just move the levers and off it pops!

HINES FLASK CO.

3431 WEST 140TH STREET • CLEVELAND 11, OHIO • PHONE ORCHARD 1-2806



MORE OUTPUT PER MAN-HOUR . . . You can step up snagging at your plant by selecting a Manhattan Portable Wheel. Abrasive, structure, grain size, bond . . . every feature of the wheel is engineered to meet *your* specific requirements . . . to remove *more* metal, *faster* . . . at lower cost. The result — more pieces done . . . plus uniform quality production and longer wheel life.

This individual engineering for your particular job means "MORE USE PER DOLLAR" when you specify "Manhattan" for your portable grinders. Let one of our experienced representatives show you how you can get more output per man-hour and lower production costs at your plant . . . with Manhattan Portable and other types of high speed, heavy duty wheels.

GRINDING WHEEL INSTITUTE MEMBER

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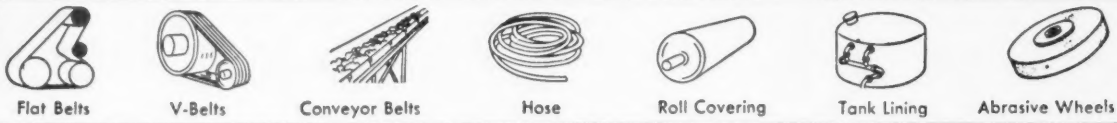
R/M

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.



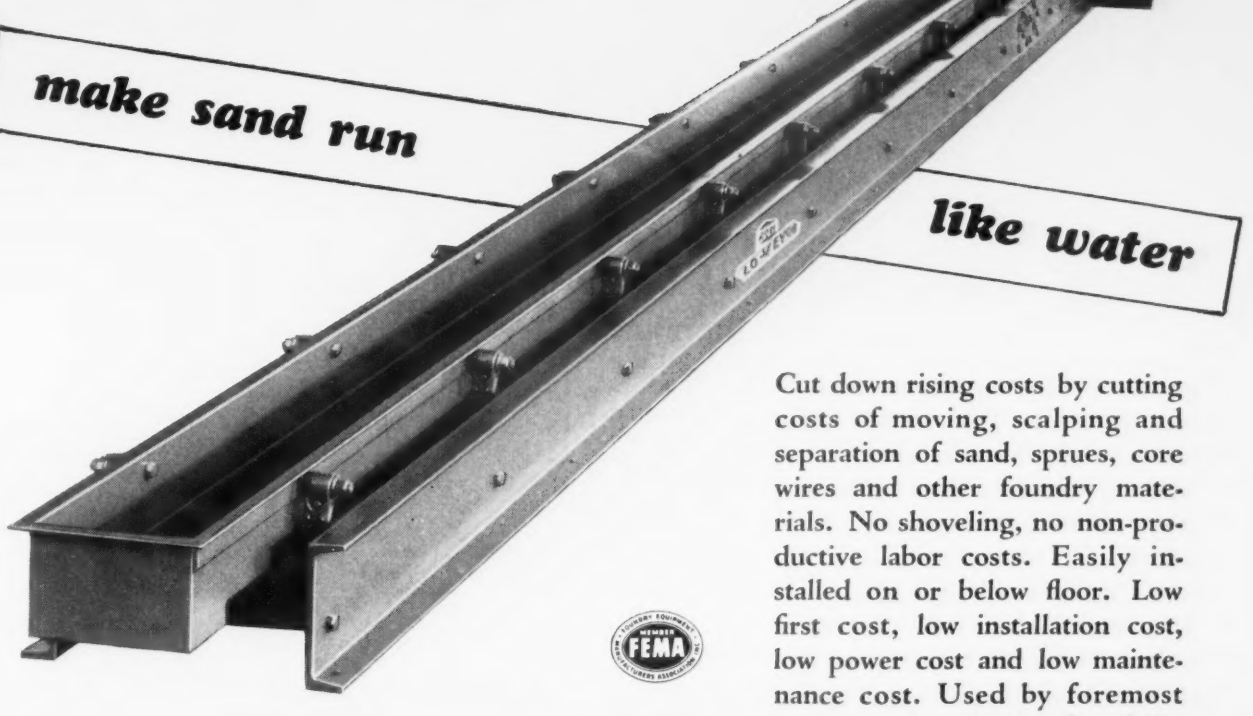
Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Bowling Balls. RM-434

AJAX

LO-VEYORS

make sand run

like water

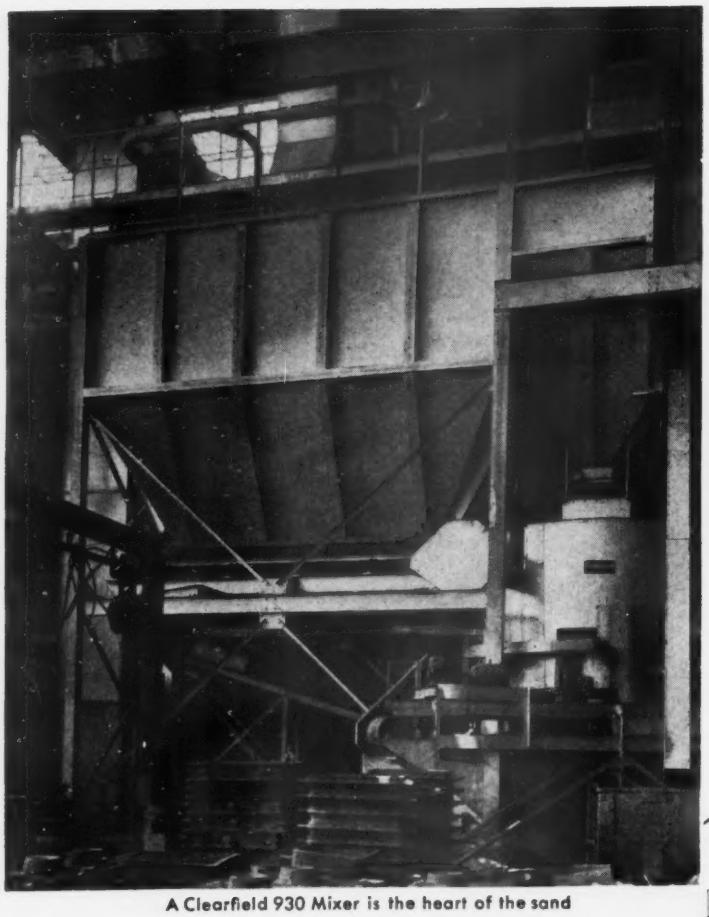


Cut down rising costs by cutting costs of moving, scalping and separation of sand, sprues, core wires and other foundry materials. No shoveling, no non-productive labor costs. Easily installed on or below floor. Low first cost, low installation cost, low power cost and low maintenance cost. Used by foremost custom and production foundries.

Write for money-saving facts.

CUT COSTS ALL ALONG THE LINE

AJAX FLEXIBLE COUPLING CO. INC. • WESTFIELD, N. Y.



A Clearfield 930 Mixer is the heart of the sand conditioning system in a gray iron foundry.

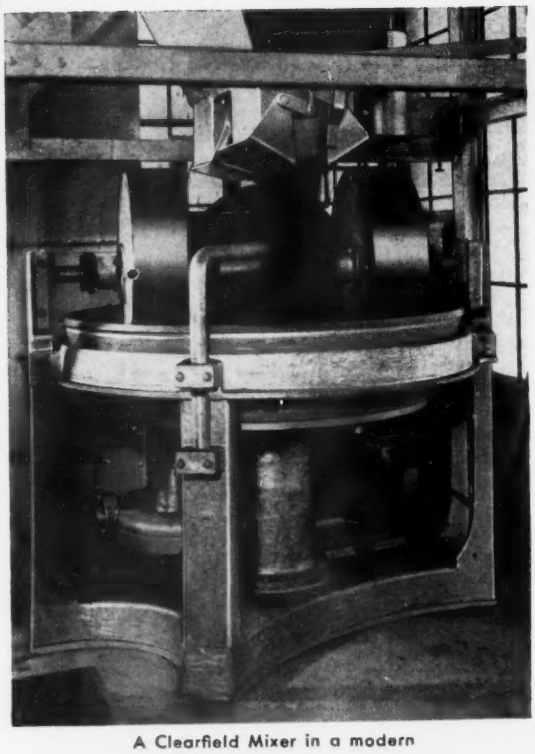
wherever foundry sand is used . . . .

the Clearfield Mixer *is needed*

A consistent and adequate supply of good foundry sand is indispensable to the efficient production of high quality castings—and that's the kind of sand supply the Clearfield Mixer turns out all the time. With a Clearfield you can assure yourself of the amount of sand you need, when you need it, where you need it and with the qualities you require.

Clearfield Mixers are available in a range of sizes to meet any requirement. As individual units or as part of an integrated sand processing system, Clearfield Mixers provide dependable, efficient and economical performance.

Write today for Catalog No. 83 for information.



A Clearfield Mixer in a modern brass foundry.

CLEARFIELD MIXER

MIXES, TEMPERS AERATES

CLEARFIELD MACHINE COMPANY

CLEARFIELD PENNSYLVANIA, U. S. A

OPERATORS' CONSENSUS:

"Easiest lining to install—by far!"

Developed by CARBORUNDUM for nonferrous crucible furnaces, these rings, plus a castable cement, make the slickest lining ever. From start to finish, *a complete lining takes just 1½ hours to install*—and that's without benefit of hoist or other equipment! The rings are set by hand, and the back-up cement is simply mixed with water and poured. What could be easier?

The rings are silicon carbide, and the cement is our special, insulating castable made of alumina "bubbles" and bond. The rings are only 1½" thick, so there's ample space for insulation. This combination makes a lining that usually *lasts 1½ to 2 years, and frequently even longer.*

The silicon carbide stays hard and clean; goes month after month without even needing patching. The alumina cement makes one of the best insulating materials available for high temperature work. It often makes possible big fuel savings per pound of metal melted; and it's not uncommon to get *one or two extra heats per day.*

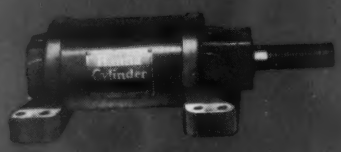
SOUND INTERESTING? If you will brief us on your operating conditions, we'll send recommendations. And don't forget, we make *all types of linings*—rings, segments, and cements. Address: Dept. A-64, Refractories Division, The Carborundum Co., Perth Amboy, N. J.

CARBORUNDUM
Registered Trade Mark

4 PROVEN REASONS*

why

Smooth, Reliable Hanna Cylinder Power is used on Machines and Equipment to Push, Pull, Lift, Press Clamp and Control



* 1 *Increased Production at Lower Cost*
2 *Better Quality Control*
3 *Reduced Manual Effort*
4 *Dependable, Trouble-Free Operation*

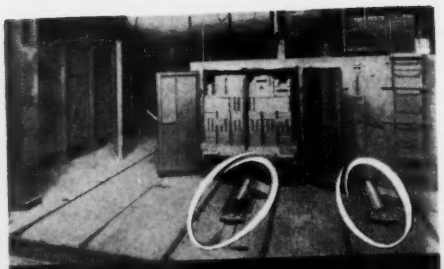
In thousands of plants . . . in hundreds of varied ways, Hanna Air and Hydraulic Cylinders are supplying power to actuate and control machines and equipment.

Daily, more and more design engineers, production and plant management men are applying Hanna Cylinder Power in new applications — for the reasons named above. And they recognize the need for the dependable performance that is built into *every* Hanna Cylinder.

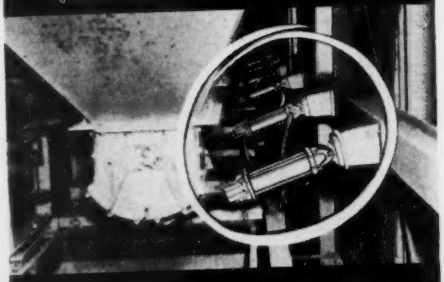
Check over the operations in your plant, the machines or equipment you build — you will probably find many applications where Hanna Cylinder Power will save time, reduce costs and help improve your product.

Hanna Engineering Works

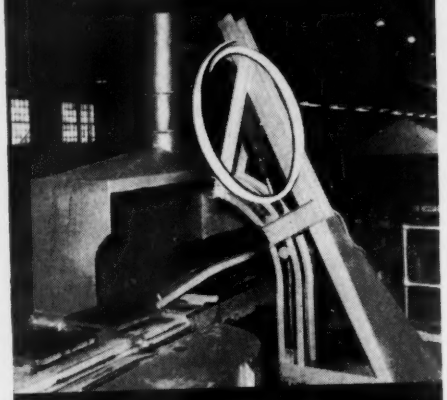
1772 ELSTON AVE. • CHICAGO 22, ILL.



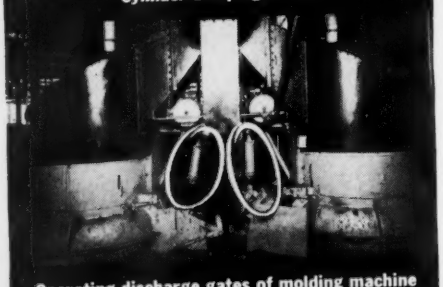
Material movement in and out of ovens



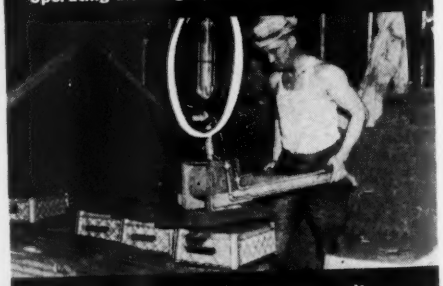
Operating battery of hopper gates



Cylinder dumping molds



Operating discharge gates of molding machine



Helping operator handle heavy units

Send for your free copies of these valuable Hanna Catalogs:

No. 236	HANNA LOW PRESSURE CYLINDERS
No. 233A	HANNA HIGH PRESSURE CYLINDERS
No. 750	HANNA MEDIUM PRESSURE CYLINDERS
No. 254	HANNA CONTROL VALVES

"EM"
SILICON BRIQUETS
Large Size Containing 2 lb. Silicon Each
3990 lb. Net Weight
ELECTRO METALLURGICAL COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION

USE THIS NEW, FAST WAY

...to handle Ferro-Alloy briquets in your foundry

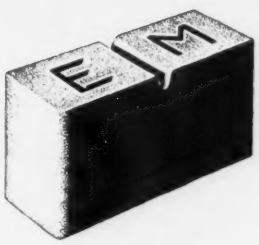
"EM" briquets can be stacked and shipped on pallets for convenient, fast handling. The pallets hold 4000 lb. of briquets and are available at no extra charge over bulk shipments. They can easily be unloaded and handled in your plant by lift truck or overhead crane. Handling time and costs are substantially reduced, and inventory-taking is simplified. The pallets are expendable and need not be returned.

In addition to pallets, shipments in bulk or in 250-lb. bags are available for those who prefer delivery in this manner.

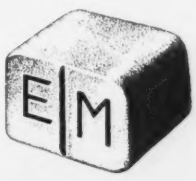
Contact the nearest ELECTROMET office for further information on how you can save with "EM" briquets.

The terms "Electromet" and "EM" are registered trade-marks of Union Carbide and Carbon Corporation.

SILICON



SILICOMANGANESE



FERROMANGANESE

ELECTRO METALLURGICAL COMPANY

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y.

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Electromet

TRADE MARK

Ferro-Alloys and Metals

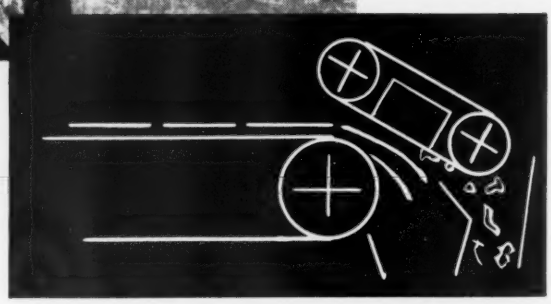
Here's one of the most important advances in magnetic tramp iron separation in years . . .

the NEW Dings "In-Line" *Self-Cleaning* SUSPENDED MAGNET

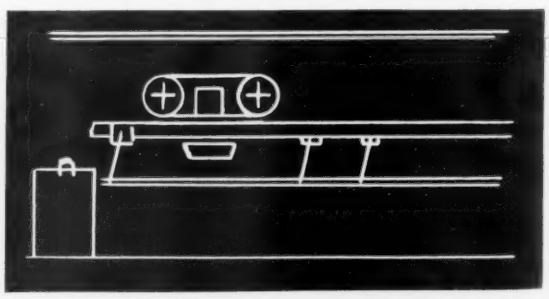
DINGS "In-Line" Magnets pull tramp iron of any shape out of conveyor belt burdens traveling at any speed. They do the job where even the largest diameter magnetic pulley would fail—where burden trajectories are almost horizontal.

Iron extraction with the Dings "In-Line" is parallel to burden travel and at the same speed. That's why this magnet can handle long iron rods with ease.

Dings "In-Line" is especially well suited for integration with pan-type conveyors being used by more and more foundries (see diagram). See your Dings representative for more information.



Dings "In-Line" extracts and discharges tramp iron in the direction of the burden flow—at the same speed as the burden moves. That's why it can pull out iron rods without tearing or gouging belts. "Selective" lifting of the iron to the magnet eliminates objectionable carryover of sand with the iron as usually experienced with magnetic head pulleys.



When used with a pan-type conveyor such as the Simplicity, Dings "In-Line" carries iron over the gap, through which the magnetically separated sand falls into a secondary conveyor, onto discharge end of conveyor.

Dings

DINGS MAGNETIC SEPARATOR CO.
4708 W. ELECTRIC AVE., MILWAUKEE 46, WIS.

INCREASE Cupola Efficiency

Large Allis-Chalmers centrifugal blower installed at Producto Machine Company. This blower has increased cupola efficiency and potential output — producing hotter and higher quality metal.

The Producto Machine Company of Bridgeport, Connecticut, has increased potential cupola output through installation of an Allis-Chalmers centrifugal blower. And since its installation they have maintained better metallurgical controls over the quality of metal produced.

Allis-Chalmers centrifugal blowers develop maximum cupola efficiency through accurate draft control. An air weight control on the blower inlet automatically delivers more or less air to the cupola as required . . . eliminates blowing off to atmosphere and wasting power.

ALLIS-CHALMERS **Centrifugal Blowers**

Their sturdy cast iron construction reduces vibration, lowers noise level and assures long life. An "overhung" impeller on the motor shaft, supported by antifriction bearings, makes the installation compact and easily accessible.

For complete information on Allis-Chalmers centrifugal blowers for your foundry, call your nearest A-C sales office or write Allis-Chalmers, Milwaukee 1, Wis.

A-4260

Foundromatic and *Regulex* are Allis-Chalmers trademarks.

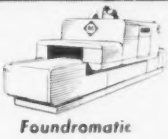
ALLIS-CHALMERS

A-C ALLIS-CHALMERS

Foundry Equipment for Bigger Output—Better Working Conditions!

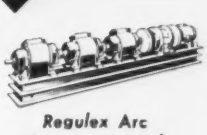
Foundromatic Shakeouts

Motors-Drives Control



Foundromatic Core Dryer

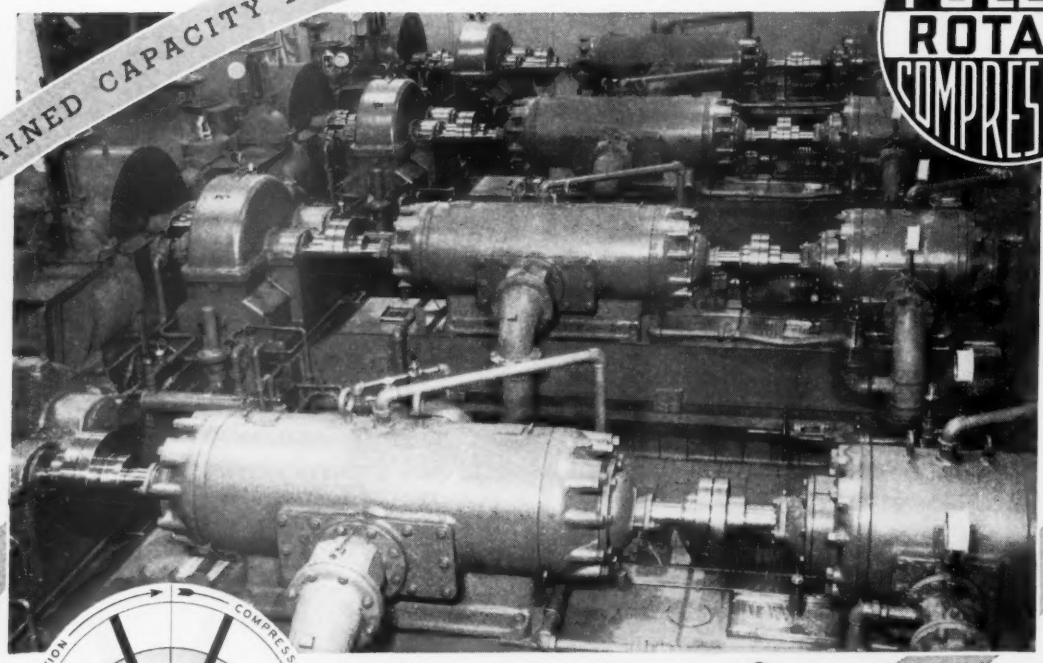
Induction Heating & Melting



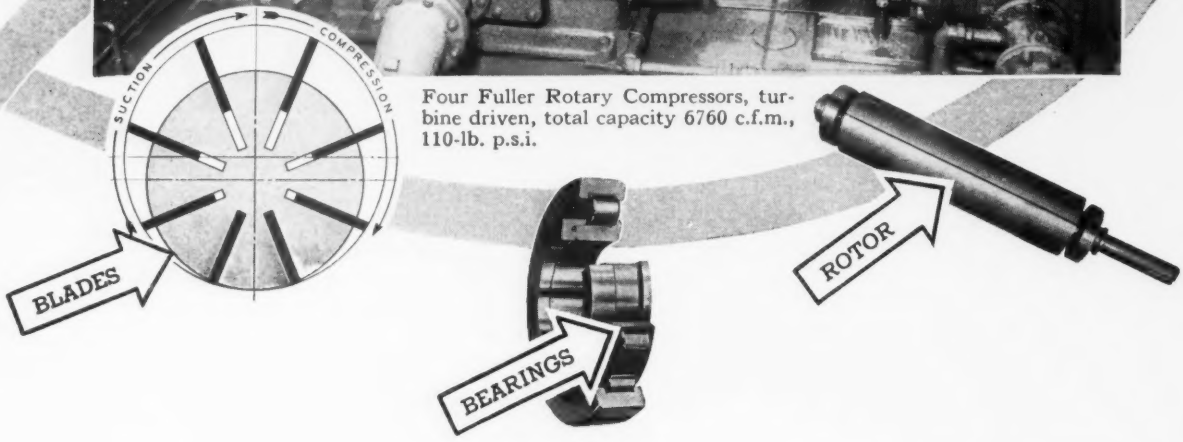
Regulex Arc Furnace Control

MAINTAINED CAPACITY FOR THE LIFE OF THE MACHINE

FULLER ROTARY COMPRESSORS



Four Fuller Rotary Compressors, turbine driven, total capacity 6760 c.f.m., 110-lb. p.s.i.



Due to design and construction, the blades of a Fuller Rotary Compressor automatically compensate for wear, thus eliminating loss of capacity. ***Maintained capacity*** is just one of the many outstanding features of the Fuller Rotary.

The fewer moving parts that make up any piece of equipment, the more continuous service at the lowest operating cost. Fuller Rotary Compressors are an outstanding example of simplicity . . . few moving parts—rotor, bearings, blades.

There is no adjustment of valves, no grinding of seats, no bearing take-up . . . moving parts are reduced to the minimum, all of which means fewer shut-downs, with less costly maintenance charges. Shut-downs are costly . . . lost time can never be recovered. Install Fuller Rotaries for day in and day out, continuous service.

Fullers are built for capacities to 3300 c.f.m. actual free-air delivery, 125-lb. pressure. Write for Bulletin C-6, illustrating and describing the design and construction of this modern compressor.

FULLER COMPANY, Catasauqua, Pa.
120 So. LaSalle St.—Chicago 3
420 Chancery Bldg.—San Francisco 4

Fuller

C-229

PIONEERS OF HIGH-EFFICIENCY VANE-TYPE ROTARY COMPRESSORS

This metal will be ROCKED and SPUN to make a better casting

Detroit Electric Furnaces melt both ferrous and nonferrous alloys at Shenango's Centrifugal Casting Division, Dover, Ohio.

Six Detroit Rocking Electric Furnaces melt alloys for huge centrifugally cast sleeves, rings and fabric rolls at Shenango-Penn Mold Company. These fast melting Detroit Furnaces achieve the close control of temperature and metal analysis required, producing better centrifugal castings with fewer rejects.

Indirect arc melting and controlled rocking action produce finer, more uniform melt results. Electrodes are always clear of the molten metal, holding alloy variation and carbon pickup to a minimum. Rocking action assures homogeneity of the metal and washes it over more refractory surface for greater heat utilization, longer refractory life.

The versatile Detroit Rocking Electric Furnace melts ferrous or nonferrous metals with speed and economy. Send us your melting requirements and our engineers will show you how "Detroit's" can do a better melting job for you. Write today!

DETROIT ELECTRIC FURNACE DIVISION

Kuhlman Electric Company • Bay City, Michigan

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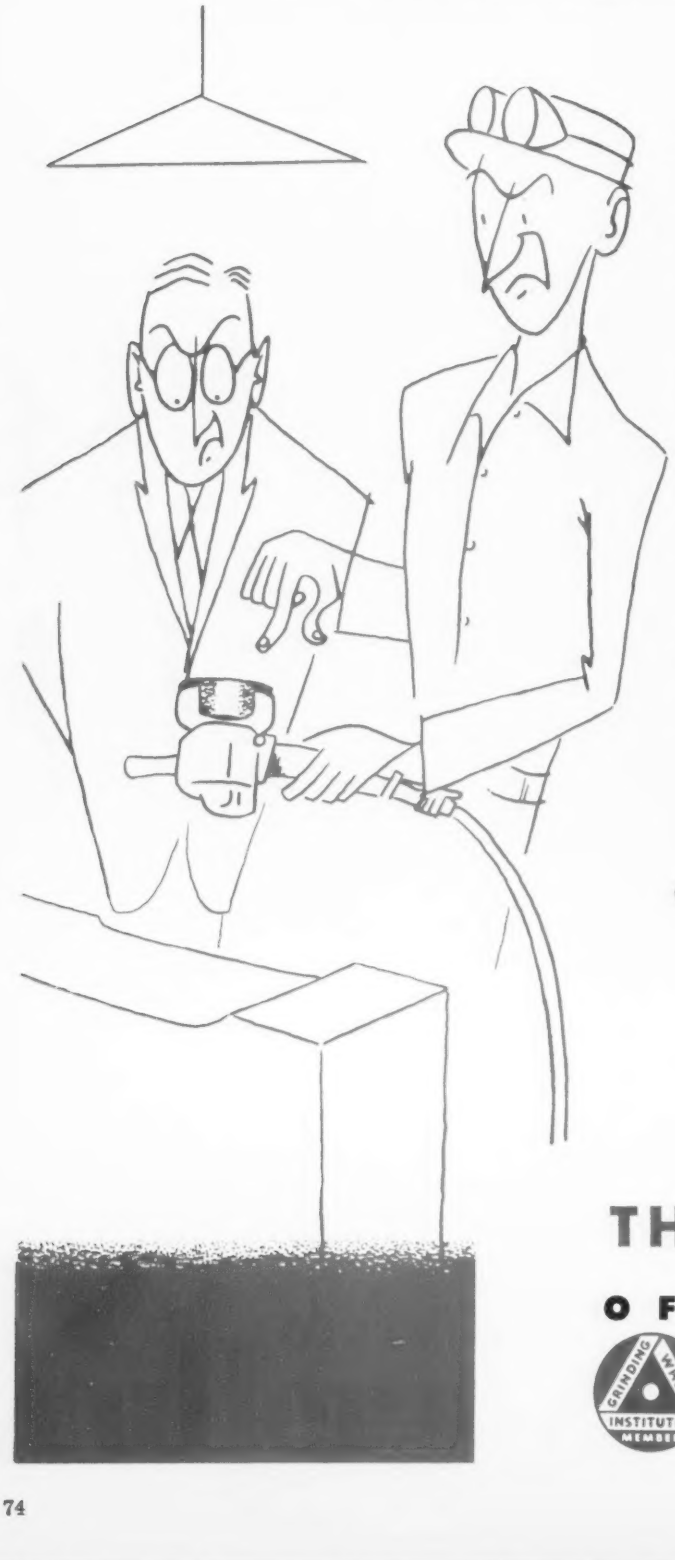
ONE OF A SERIES OF ADVERTISEMENTS TELLING YOU

A LOADED WHEEL GATHERS

BUT THE CORRECT STERLING SPECIFICATION SAVES YOU

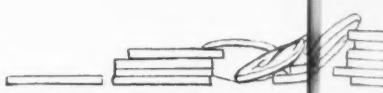


Many grinding wheels load with the metal being ground. Others glaze. Between these two types of wrong wheels is hidden the grinding specification that is just right. Finding that specification is a tough job, but Sterling engineers and technicians are doing it time and time again—can do it for you!

The difference between the right and wrong specification can be the difference between making and losing money on your grinding operations. The correct Sterling specification costs you no more, but it does take extra study to produce it. It is this study that makes the difference. It creates the "Wheels of Industry" that are naturally the best you can use.

Don't take chances with the wrong specification. Use Sterling Tailormade Grinding Wheels. Eliminate guesswork. Ask for the free services of a Sterling abrasive engineer *today*. Your letter or phone call will bring him quickly.

● Correct and proven specifications are suggested in this series of important folders on proper grinding. Send for your copies . . . no obligation, naturally!



THE **STERLING A**

OF THE CLEVELAND Q

GRINDING WHEEL INSTITUTE MEMBER

TIFFIN, OHIO

WHY YOU SHOULD USE STERLING GRINDING WHEELS

NO PROFITS

PLENTY OF TIME AND MONEY

The sectional view of the wheel shows the location of the mounting nut assembly and the rigid, steel ring.

The deeply embedded "fingers" of the metal insert reduce the effect of torque on the threaded insert . . . assure greater safety and reliability.

ABRASIVES DIVISION

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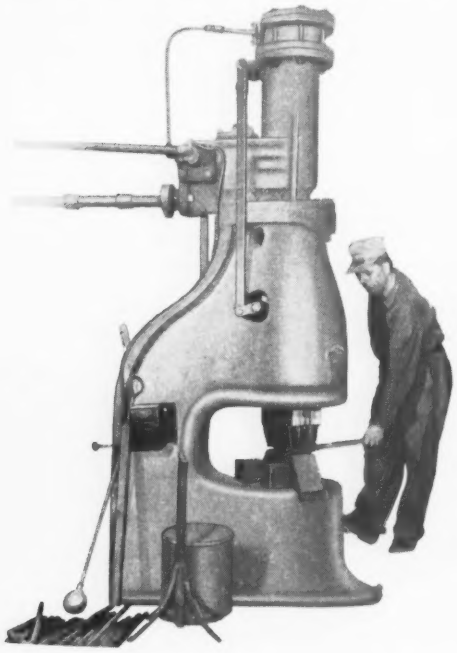
DISTRIBUTORS IN ALL PRINCIPAL CITIES

EVERY FOUNDRY CAN SAVE MONEY ON TOOL DRESSING HAMMERS



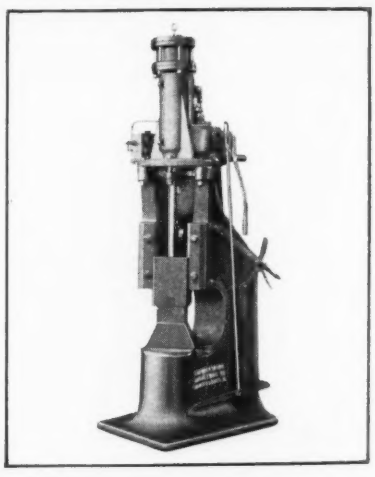
ADEQUATE CAPACITY AT LOW INVESTMENT

Here is the answer to the foundryman's need for a general utility forging hammer to take care of the tool dressing or general light blacksmithing work that every foundry finds need for.

Size for size there's no better buy than a Chambersburg. Costs less to install, costs less to operate, costs less to maintain. Easy to run, easy to control. Variable stroke permitting wide flexibility of operation.

SIZE POUNDS	FACE OF RAM Inches	USUAL DIE FACE Inches	FLOOR SPACE Inches	AVERAGE AIR CONSUMPTION CFM at 100 psi
100	3½x6¾	3x6½	32x20	32
150	4¾x6¾	3x6½	32x20	39
200	5x7¾	4x7	40x26	58
250	6x7¾	4x7	40x26	65
300	7x7¾	4x7	40x26	73
400	6½x9¼	5x8½	50x32	104
500	8x9¼	5x8½	50x32	116

NO NEED FOR SELF-CONTAINED COMPRESSOR. Can be run off the average foundry air line, eliminating the cost of a built-in compressor. Installation is easy. Frame and anvil are one piece, avoiding costly foundation. Most rugged hammer built. The first one we made over 50 years ago is still pounding.



Write today for descriptive bulletin No. 7-L-8.

CHAMBERSBURG ENGINEERING COMPANY • CHAMBERSBURG, PENNA.

CHAMBERSBURG

THE HAMMER BUILDERS

Smooth Going...

EVERYTHING'S UNDER CONTROL

. . . AND IT'S THE SAME STORY WHEN YOU USE SMITH L-O

You can bet your water skis Smith L-O means *smooth going.* And, that is a statement of fact! Smooth going with Smith L-O comes from the *controlled uniformity* of the grade core oil that is best suited to your operation. The grade you require means a lot, too, and its use is based on the recommendation of the qualified Smith Foundry Serviceman in your area. Call him in when you want assistance . . . it is his business to study your specifications, and it's a habit of his to come up with the right answer. Yes . . . look first to Smith L-O . . . *the name that stands for a service as well as a product.*

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Smith L-O Core Oil

ROD DIP LIQUID PARTING

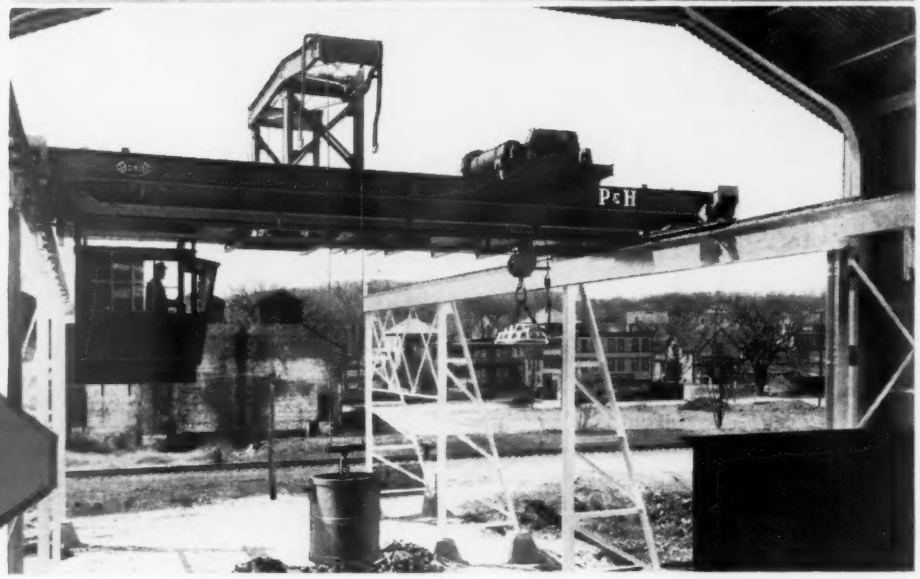
SMITH OIL & REFINING CO.

MANUFACTURERS OF L-O AND CERTIFIED CORE OILS
INDUSTRIAL OILS DIVISION • ROCKFORD, ILLINOIS

P&H OVERHEAD CRANES

How this Magnet Crane A. M.

"Doubles" as a Cupola Charger P. M.



Ordinarily, we don't go looking for ways to do ourselves out of any business. Like telling people how to make *one* crane do the work of *two*.

But here's an idea you should know. It could (and very well might!) save you some real money — if your plant setup is such that you could take advantage of it.

This smartly engineered crane is a dual-purpose unit. In the morning, it works as a foundry makeup crane, filling buckets for the cupola. In the afternoon, it is used as a cupola charger to move the buckets. Never a dull moment.

We built this combination crane for a well-known west coast manufacturer. It is doing a wonderful job. Perhaps such a crane would save time and money on your operations. If so, we'd be glad to build one for you. At least we'll be glad to give you all the facts. There's no obligation. Write us.

P&H OVERHEAD CRANE DIVISION
HARNISCHFEGER CORPORATION
MILWAUKEE 46, WISCONSIN

the P&H Line

FABREEKA

Under Molding Machines

REDUCES THE EFFECTS of heavy impact shock and destructive vibration . . .

FABREEKA PADS, Bushings and Washers are installed under Molding Machines, Shakeout Machines, Tumbling Barrels and other heavy machinery to reduce the effects of heavy impact shocks and destructive vibration.

FABREEKA has demonstrated its ability to prevent breakage of machine parts and to keep bolts tight, thereby reducing maintenance and increasing production.

FABREEKA has long life, and this important advantage makes its final cost a low cost.

Write for latest literature

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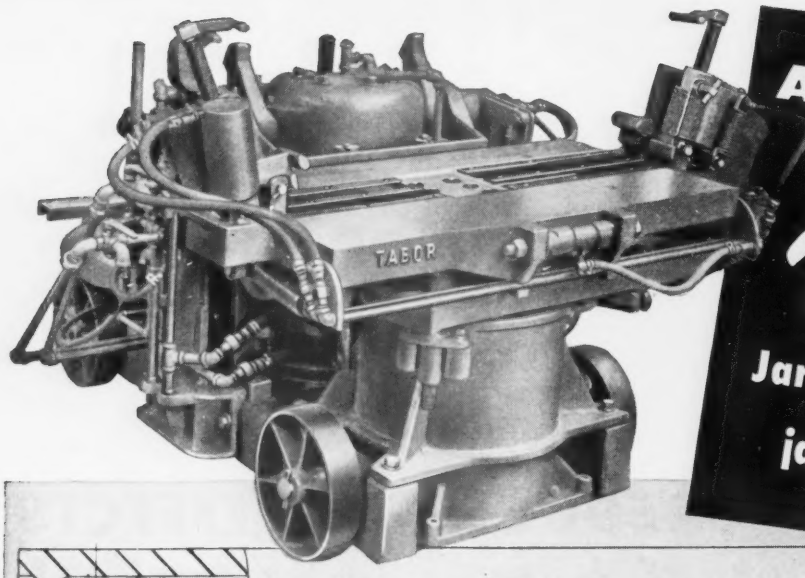
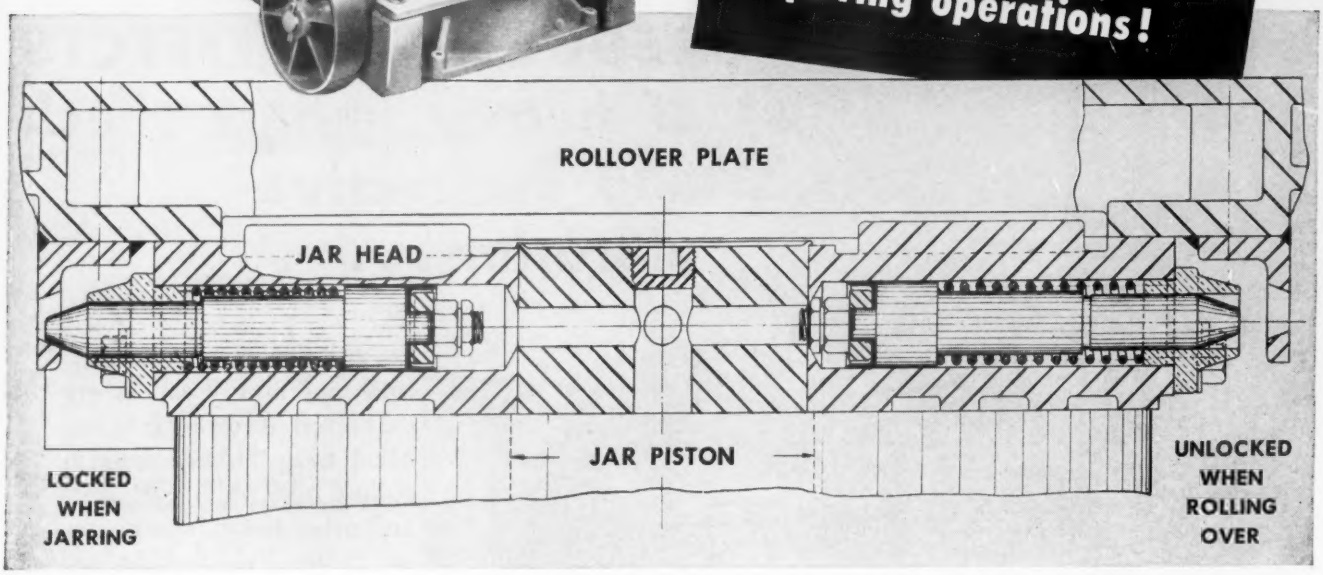


ANOTHER TABOR FIRST...

Rollover Plate and Jar Head locked during jarring operations!



ROLLOVER PLATE—JAR HEAD LOCKING DESIGN
The above sectional drawing illustrates Tabor's new locking arrangement. Jarring air pressure automatically throws rugged pins into seats under the rollover plate. Pins retract under spring tension when jarring valve is closed.

HERE'S a feature never before offered in jar, power rollover, power draw machines. New Tabor construction locks rollover plate and jarring mechanism *into one rigid assembly* the moment jarring air is introduced.

This gives you *four* distinct advantages:

(1) Effectiveness of jarring blow is increased 25%.

(2) Ramming effect is equalized *all over the mold.*

(3) Does away with unwanted "secondary jolt" between plate and jar head—adds greatly to life of both members.

(4) Eliminates all plate wobble, even when handling a mold with uneven weight distribution.

Always big producers, Tabor Rollovers also feature the new quick-change-over table which permits *independent* setting of all four clamps—a table design which is invaluable in either core room or jobbing shop where pattern changes are frequent.

Get full details. Write, wire, or phone today.

Factory representatives in most principal cities. Write us for details and name of our representative nearest you.

The TABOR Manufacturing Co.

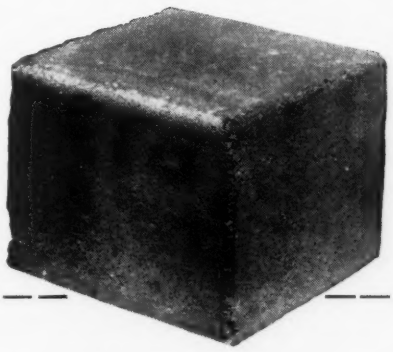
SINCE 1884 MANUFACTURERS OF FOUNDRY MOLDING MACHINES • OUR SEVENTIETH YEAR

6225 TACONY STREET • PHILADELPHIA 35, PENNA.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

EXPORT DEPARTMENT, 1010 SCHAFF BLDG., PHILA. 2, PA.

REDUCE MISRUNS by as much as 50%



Iron deoxidized with FERROCARBO® patented Briquettes is *more fluid* at casting temperatures than untreated iron. It flows more readily into thin sections or complicated molds. You get better castings...fewer misruns. Leading foundries report up to 50% reduction in misruns after using FERROCARBO in the charge.

Deoxidizing with FERROCARBO gives you additional advantages, too: Silicon recovery increases materially. You can charge more scrap—either steel or cast iron—since FERROCARBO reduces the chilling tendency.

The man who uses your castings benefits, too. The castings you supply him are finer-grained, denser, stronger...much easier to machine because they contain fewer segregations and chilled or hard spots.

FOR ALL THE FACTS, call your FERROCARBO Distributor today. Or write for the free booklet, "Producing Superior Gray Iron Castings." Address: The Carborundum Company, Dept. F 84-41, Niagara Falls, N.Y.

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FERROCARBO

REGISTERED TRADE MARK

by CARBORUNDUM

REGISTERED TRADE MARK

84-46

Chicago
RESINOID
Grinding
Wheels

Remove
METAL Faster

When high-speed stock removal is required, even to the closest tolerances, use Chicago Resinoid Grinding Wheels. They have greater strength, longer life, and have been proven for efficiency. Available in the size and grain necessary for the job.

Complete Line of Abrasive Products

Let Chicago Wheel's carefully engineered abrasive products work for you. They're recommended by machinists everywhere, and backed by more than 50 years of manufacturing experience.

Mounted Wheels • Grinding Wheels
Cut-Off Wheels • Internal Wheels
Novaculite • "XL" Bond Wheels

Chicago Wheel & Mfg. Co. Dept. F
1101 W. Monroe St., Chicago 7, Ill.
Gentlemen: Please send me complete information on Chicago Resinoid Grinding Wheels.
Name .....
Company .....
Address .....
City ..... Zone ... State .....

READERS' COMMENT

The Twin Molding Machine

TO THE EDITORS:

I wish to thank you for your article in the May issue about the Mezger twin molding machine. I am sure that every reader of this article has felt that it continues the tradition of your magazine to be the first to describe the latest foundry equipment.

The machine you described in your article is the type called MK2, and the flasks used are up to 19 x 24 in. and 12 in. high, as you mentioned. However, the manufacturer makes larger twin molding machines identical to the MK2, but with larger flask dimensions. These dimensions vary according to the desires of the buyer. A type MK2 of this machine, designed and built by Eduard Mezger, who owns this company and who is a well known specialist in the foundry business, is to be exhibited at the AFS show in Cleveland.

I wish also to correct a typographical error in the name of the company where the operating pictures of the MK machine were taken. The company is the J. Jakob Rieter & Co. Ltd. in Winterthur, Switzerland, whose foundry manager, Eugen Sinner will attend the Cleveland show.

NICOLAS G. HAYEK
Maschinenfabrik & Eisengiesserei Kallnach
Kallnach, Switzerland

* * *

Concerning the Weather

I got a big kick out of the "We Got Hit" write-up on page 10 of the April issue of FOUNDRY. I am certainly glad that most of your editors were able to make it to the office despite the weather, for I would certainly have missed a good issue of FOUNDRY if they had not made it.

HERBERT A. REECE
140 *South Hibiscus Drive*
Miami Beach 39, *Fla.*

* * *

Molding Sand Preparation

TO THE EDITORS:

Please accept my thanks and appreciation for the copy of May FOUNDRY. The article which appeared under my name may, I hope, give rise to pertinent questions related to mechanically controlled preparation of molding sand, simplified power-driven equipment designed to insure efficient mulling, prolonged cooling and aeration, and less personal supervision and labor.

Permit me to compliment the editorial staff for the many innovations and improvements inaugurated during the past few years in FOUNDRY—including literary content, technical information, general setup and style. Material presented on pages 140 to 197 inclusive in the May issue merits special mention.

A. A. WICKLAND
Foundry Engineer
6129 *North Claremont Ave.*
Chicago 45

* * *

Spots Error in Formula

TO THE EDITORS:

In reading over the formulas contained in the "Foundry Data Sheet" in the March issue I found that the formulas for determining the weight of a flywheel are in error. The formulas given are incomplete in that they determine the casting's volume and not its weight as was intended.

FRANK MASTRANTONIO
Technical Supervisor
Hodgson Foundry Co.
Chicago

Editor's Note: Sharp eyes of Reader Mastrantonio did detect an error in the first of the formulas on page 208 relative to determining the weight of a flywheel hub which, due to some mathematical hocus pocus, resulted in use of the factor 0.817 instead of 0.204. The correct formula may be derived from the usual one for determining the weight of a hollow cylinder:

$$W = \pi \left(\frac{D^2}{4} - \frac{d^2}{4} \right) T\, w$$

where D and d are the outer and inner diam of the hub, T is the thickness and w is the weight per cubic inch of iron, or 0.26. This is resolved into: $W = (D^2 - d^2)\ T \times 0.204$.

However, the second formula is correct for weight of the wheel arms and is derived from:

$$W = \pi \left(\frac{D}{2} \times \frac{d}{2} \right) L\, w$$

where D and d are diameters of the major and minor axes of the ellipse, L is the length of the arm and w is the weight of a cubic inch of iron.

* * *

May Issue Attractive

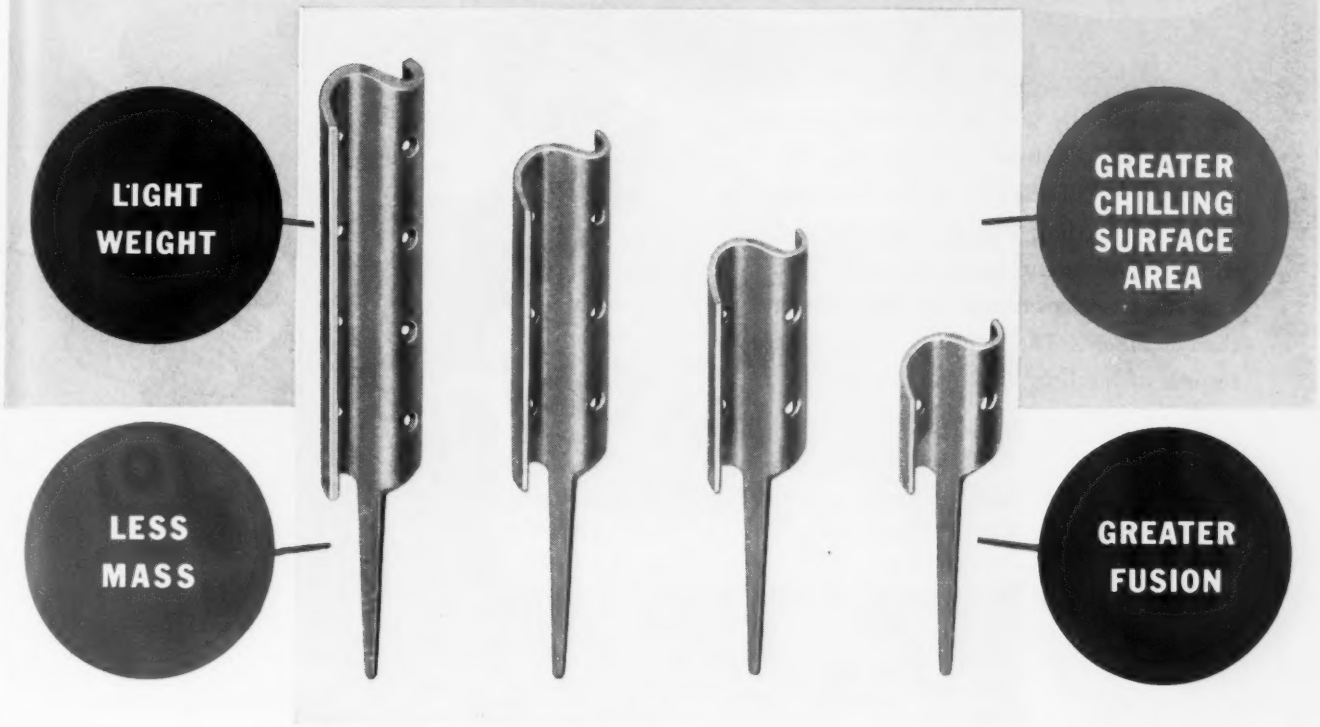
TO THE EDITORS:

I congratulate you and your associates on the May 1954 issue of FOUNDRY. It is a beautiful issue and I think you have done a great job.

G. DIXON SHRUM
Secretary-Treasurer
Foundry Facings Manufacturers Association
Pittsburgh 19

Now fine FANNER FAN-S-CHILLS

for general chilling applications—light or heavy sections



Patent Pending

WITH THE EXCLUSIVE DESIGN
THAT PROVIDES FAR GREATER CHILLING *plus* EXTRA SAVINGS IN COST

Here is a fine FANNER Chill that is winning the praise of users everywhere throughout the industry. The Fan-S-Chill is another result of the continuous research and development that have produced so many other fine FANNER Chills.

The Fan-S-Chill, through its curved "S" design offers 75% more chilling surface with less weight since there is no solid mass. Moreover because of its curved "S" design and holes which permit more thorough flow of metal it fuses and locks into the cast metal solidly and completely. Since it is light in weight it offers savings in cost, shipping and handling. Made of formed steel, it is ideal for general chilling purposes, especially in steel.

You will be interested in the many cost saving features of the fine FANNER FAN-S-CHILL, so write today for samples and prices.

STANDARD SIZES

1/2" to 4" in length. 1-1/4" in width. Made in heavy, medium and light gauges. Copper, aluminum or tin coated.

•

Lighter or heavier FAN-S-CHILLS in special sizes can be made on request.

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The Fanner Engineering Department will cooperate with you on special applications.

THE FANNER MANUFACTURING CO.

Designers and Manufacturers of Fine Fanner Chaplets and Chills

BROOKSIDE PARK CLEVELAND 9, OHIO

Take it from me

When You Buy the BEST... You're Bound to Get a BARGAIN!

Yes, you actually save money when you use Sterling Steel Flasks in your foundry. The famous ROLLED STEEL CHANNEL construction gives Sterling Flasks the strength and rigidity to withstand abuse, year after year. You can treat 'em rough and they still retain their accuracy. The unusually long service records of Sterling Flasks, in America's leading foundries, bring the annual flask cost down to rock bottom. That's why we say, *when you buy the BEST . . . you're bound to get a BARGAIN.*

Style 3/8 ND-RT flasks used in iron foundry.

Check these Sterling Features

Rolled steel channel construction . . . Solid reinforcing ribs . . . Heavy rolled steel sand flanges . . . Square corners . . . Full width bearing . . . Partings planed to an accuracy of .005".

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Manufacturers of Foundry Equipment for Almost Half a Century

Getting Ready

At a time when demand for castings is off from recent record peaks, and operations are spotty, approximately 15,000 from the foundry industry gathered at Cleveland from May 8 to 14 to see the latest in machines, materials and services and to consider the progress made in the technical and production phases of foundry practice. Several interesting conclusions can be drawn from this remarkable demonstration of interest.

It must be conceded that the industry seems less concerned with problems created by the immediate business situation than with developments that will lead to progress in the future. Foundrymen are anxious to secure information on machines, materials and processes that will permit their foundries to improve the quality of castings, reduce production costs, and produce castings that will meet completely the exacting demands of the customer. They realize that progress in these directions will provide a means for enlarging the market for castings.

Interest in shell and pressure molding, in automatic and semi-automatic controls, and in various types of new equipment and processes indicates a definite break with tradition and a trend toward an industry which utilizes all of the modern production tools and ideas. As has been demonstrated several times in recent years, the foundry industry is hungry for new ideas, and will spend time, effort and money to determine the potential of these developments for castings production.

One could not visit the tremendous show and view the individual displays without realizing the important contributions to foundry progress which are being made by those organizations producing foundry equipment and supplies. Not only have these companies kept pace with immediate demands but in a great many cases they have anticipated future problems with developments in machines and materials. An example may be found in the trend toward automatic and semi-automatic controls. Labor shortages during both recent wars, and the resultant present high wage rates have forced the greater use of machines in the production of castings. Equipment manufacturers have designed or are in process of perfecting machines to meet the need.

The recent gathering at Cleveland proved that the foundry and allied industries are awake to the challenge of the future and are doing something about it.

Tremendous progress should result.

Frank G. Steinebach

Editor

FRANK J. DOST
President

BRUCE L. SIMPSON
Vice President

Future Trends Revealed at CONVENTION

THE APPROXIMATELY 15,000 persons who participated in the 58th annual convention of the American Foundrymen's Society in Cleveland, May 8-14, found ample evidence of the trend toward more efficient production of better quality cast products.

Technical discussions during the week disclosed additional knowledge concerning correct procedure in foundry operations; the Foundry Show demonstrated that considerable equipment is available for eliminating the human factor in carrying out many of those practices mechanically and automatically.

Convention visitors were provided a diversity of

Left—Collins L. Carter, AFS retiring president, delivers his address at the annual business meeting. Speaker's platform at meeting is shown below

The Cleveland convention attracted nearly 15,000 registrants. Here is a view of the registration center at Public Auditorium Monday morning

and EXHIBITS

attractions. More exhibits of equipment, supplies and services were available than ever before. Technical sessions encompassed a variety of subjects ranging from discussions of theory to topics having practical application to operating problems.

The most extensive program of practical shop operations courses ever arranged drew wide attention. Eleven courses were presented covering subjects relating to brass and bronze, malleable iron, gray iron, sand and refractories.

Many foundrymen took advantage of the program arranged by Northeastern Ohio Chapter for inspection of a number of Cleveland foundries and pattern shops. Ford Cleveland Foundry proved to be the principal attraction for plant visitors, playing host to approximately 800 guests on Friday, the concluding day of the convention.

Business Meeting—A year of considerable progress in activities of the AFS was reviewed by President Collins L. Carter, president, Albion Malleable Iron Co., Albion, Mich., at the annual business meeting Wednesday morning. He predicted a tremendous growth during the next five years. Among the year's leading developments reported by Mr. Carter were:

Society membership of 11,600 as of Apr. 1 was an increase of about 500 since a year ago. The number of chapters was unchanged at 42.

Eight regional conferences were held, with 26 chapters participating Additional conferences are planned for the coming year.

Research activities now embrace nine separate projects sponsored by various divisions.

A number of technical publications were issued covering such subjects as risering of gray iron, steel sand properties at elevated temperatures, principles of gating, sand reclamation, molding machines, cupola operation, and safety, hygiene and air pollution. Revision of the *Cast Metals Handbook* is a project for the near future.

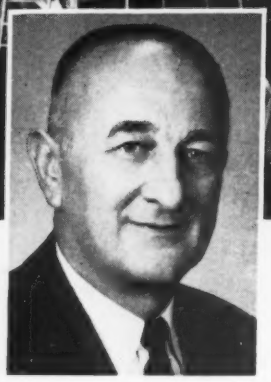
Appointment of Hans J. Heine as technical director and Ashley B. Sinnett as educational director of the society.

Increase in the board of directors from 18 members to 24.

Start of construction of the AFS headquarters building in Des Plaines, Ill. Completion of the $275,000 structure is expected about August.

Apprentice Contest—Prior to the awarding of prizes in the annual apprentice contest, W. J. Hebard, Continental Foundry & Machine Co., East Chicago, Ind., and chairman of the Education Division, spoke briefly. He praised the work of the division's Apprentice Contest Committee, headed by Roy W. Schroeder, University of Illinois, Chicago, in carrying on this competition, which was originated in 1924.

In announcing the 1954 contest results, William W. Maloney, secretary-treasurer, said that the 352 entries from 138 companies constituted a new record. The judges' decision showed that two winners duplicated first-place victories they achieved in the 1953 contest. These were William E. Morehead, Caterpillar Tractor Co., Peoria, Ill., first in



FRANK C. CECH

WILLIAM A. MORLEY

NEW DIRECTORS

HAROLD L. ULLRICH

B. GEORGE EMMETT

W. M. HAMILTON

EUGENE R. OESCHGER

L. H. DURDIN

WILLIAM R. PINDELL

CHARLES E. BRUST

More than 900 persons attended the annual banquet on Wednesday evening

the gray iron molding division, and Robert J. Luckenbill, Dodge Steel Co., Philadelphia, who repeated as victor in the steel molding division.

Top place in nonferrous molding went to Donald R. Tetzlaff, Allis-Chalmers Mfg. Co., West Allis, Wis. Winners in the patternmaking divisions were Steve A. Simon Jr., Master Pattern Co., Cleveland, for wood patternmaking and Herbert J. Tidik, Ford Motor Co.'s Cleveland Foundry, Berea, O., for metal patternmaking.

Second and third place winners respectively, in the various divisions were: Gray iron molding—George J. Ryan, Brown & Sharpe Mfg. Co., Providence, R. I., and Isaiah Doll, the Hill Acme Co., Cleveland. Steel molding—Max W. Koenigshof, Clark Equipment Co., Buchanan, Mich., and Richard F. Bernier, Bucyrus-Erie Co., South Milwaukee, Wis. Nonferrous molding — Allen C. Bergadine, General Magnesium Foundries, Belleville, Ill., and LeRoy J. Moczynski, Nordberg Mfg. Co., Milwaukee. Wood patternmaking — Lewis Backus, Cleveland Standard Pattern Works Inc., Cleveland, and John T. Farrington, Brown & Sharpe Mfg. Co., Providence, R. I. Metal patternmaking—William M. Piotrowski, City Pattern Foundry & Machine Co., Detroit, and John S. Bolibrush, Motor Patterns Co., Cleveland.

J. T. WESTWOOD JR.

CLAUDE B. SCHNEIBLE

The five first-place winners were present at the meeting as guests of the AFS to receive their certificates and cash prizes from President Carter.

New Officers and Directors—Election of new officers and directors proposed by the nominating committee was announced by Secretary-treasurer Maloney. Frank J. Dost, who succeeds Mr. Carter as president for 1954-55, served the society the past year as vice president. President of the Sterling Foundry Co., Wellington, O., Mr. Dost received his engineering education at the University of Cincinnati and entered the foundry industry in 1926 with the Cincinnati Milling Machine Co. In 1929 he became foundry engineer for Williams & Co. Inc., Cincinnati and Cleveland, and four years later joined the Sterling Foundry Co. He has been president since 1952. Mr. Dost is a past chairman of Northeastern Ohio Chapter of the AFS.

New vice president is Bruce L. Simpson, president, National Engineering Co., Chicago. Graduated from Northwestern University in 1934, Mr. Simpson later received a degree from Northwestern Law School. He joined National Engineering Co. as a purchasing agent, later was appointed vice president in charge of production, and in 1943 succeeded his father, Herbert S. Simpson, as president.

New directors for three-year terms are: William

Technical sessions occupied many convention visitors. This is the audience at a pattern meeting

A. Morley, foundry manager, Olney Foundry Division, Link-Belt Co., Philadelphia; Frank C. Cech, Cleveland Trade School, Cleveland; W. M. Hamilton, manager, Crane Co., Chattanooga, Tenn.; B. George Emmett, works manager, Los Angeles Steel Casting Co., Los Angeles; Harold L. Ullrich, castings sales engineer, Elizabeth, N. J.; Eugene R. Oeschger, general manager, foundry department, General Electric Co., Schenectady, N. Y.; L. H. Durdin, president, Dixie Bronze Co., Birmingham.

Directors for two-year terms: William R. Pindell, vice president and general manager, Northwest Foundry & Furnace Co., Portland, Oreg., and Charles E. Brust, president, Eastern Malleable Iron Co., Naugatuck, Conn.

Directors for one year: Claude B. Schneible, president Claude B. Schneible Co., Detroit; J. T. Westwood Jr., president, Blue Valley Foundry Co., Kansas City, Mo.; and Collins L. Carter, retiring president of the society.

Under the revised AFS by-laws, new officers and directors take office immediately after the annual meeting.

Hoyt Lecture—An exceptionally comprehensive analysis of his subject was presented by Harry W. Dietert, chairman, Harry W. Dietert Co., Detroit, in the Charles Edgar Hoyt Lecture on "Processing of Molding Sands." In opening the lecture Mr. Dietert pointed out that not only have we learned considerable about the properties required in molding sands to produce good castings, but equipment now is available to take over the job of seeing that these properties are attained accurately in the mixtures that are prepared.

Among the subjects covered in his discussion were: Proper selection of various types of sand grains as to composition; practice and theory of sand blending; additives used with molding sands and their influence in eliminating various casting defects; bonding materials; effects of moisture; types of ramming; sand storage and reclamation. The lecture was extensively illustrated to show equipment used to process sands and to demonstrate how processing affects the quality of sands as reflected in the resulting castings.

Annual Banquet—More than 900 persons—the second largest attendance in history—participated

Harry W. Dietert giving the annual Hoyt lecture. His paper discussed processing of molding sands

in the AFS annual dinner in Public Auditorium Wednesday evening. President Carter presided. Highlight of the program was the presentation of awards to six men for outstanding service to the society and the foundry industry. The awards presentations were made by Fred J. Walls, International Nickel Co., Detroit, a past president of AFS and chairman of the Board of Awards.

Honorary life memberships in the society were presented to Leroy P. Robinson, vice president, Archer-Daniels-Midland Co., Cleveland, Earl M. Strick, finishing superintendent, Erie Malleable Iron Co., Erie, Pa. and Collins L. Carter, retiring president of AFS.

The Joseph S. Seaman medal was presented to Thomas E. Eagan, chief research metallurgist, Cooper-Bessemer Corp., Grove City, Pa. Roy A. Gezelius, works manager, General Steel Castings Corp., Eddystone, Pa., received the Peter L. Simpson medal. Walter E. Sicha, chief, Cleveland Research Division, Aluminum Co. of America, was awarded the William H. McFadden medal.

The dinner provided the occasion for President Carter to announce that a $50,000 gift had just been made to the society by the Pangborn Corp., Hagerstown, Md., in the names of Thomas W. Pangborn, president, and John Pangborn, vice president, founders of the company. The money is to be used for educa- (*Please turn to page* 136)

AFS apprentice contest winners shown at the convention to receive their awards. They are, left to right: Steve A. Simon Jr., Herbert J. Tidik, Robert J. Luckenbill, Donald R. Tetzlaff and William E. Morehead

Right—Information concerning foundry safety, hygiene and air pollution was available at this booth conducted by the society

Entries that won prizes in the annual apprentice contest were on display at booth shown below

FOUNDRY SHOW

1954 AFS CONVENTION

Features New and Improved Equipment

THE 1954 Foundry Show, held in Cleveland's Public Auditorium, May 8-14, was the largest and one of the most interesting ever staged by the American Foundrymen's Society. Practically all classes of machines, materials and services were to be found in the various displays which filled the large underground exhibition hall, the lower level of the auditorium, and about half of the auditorium arena floor.

An acceleration in the trend toward automatic control of operations was revealed in many displays. The exhibition also showed that the design of equipment is going beyond the simple use of automatic controls into the field of automation, where a number of machines are hooked together by material handling equipment and a series of operations is performed with manpower being used only at the beginning or end.

The show demonstrated that much progress has been made in the design and production of foundry equipment during the past few years. The machines on display had a finished look that placed them on a par with fine machine tools. Furthermore, utilization of new designs and improved materials promises longer life and more accurate operation for foundry machines of all types.

A feature of the show was the large number of companies showing equipment and material for producing shell molds. A number of machines for producing shells were in operation, and at several booths metal was melted and castings were poured in shells. Shell molding and pressure molding demonstrations attracted considerable interest.

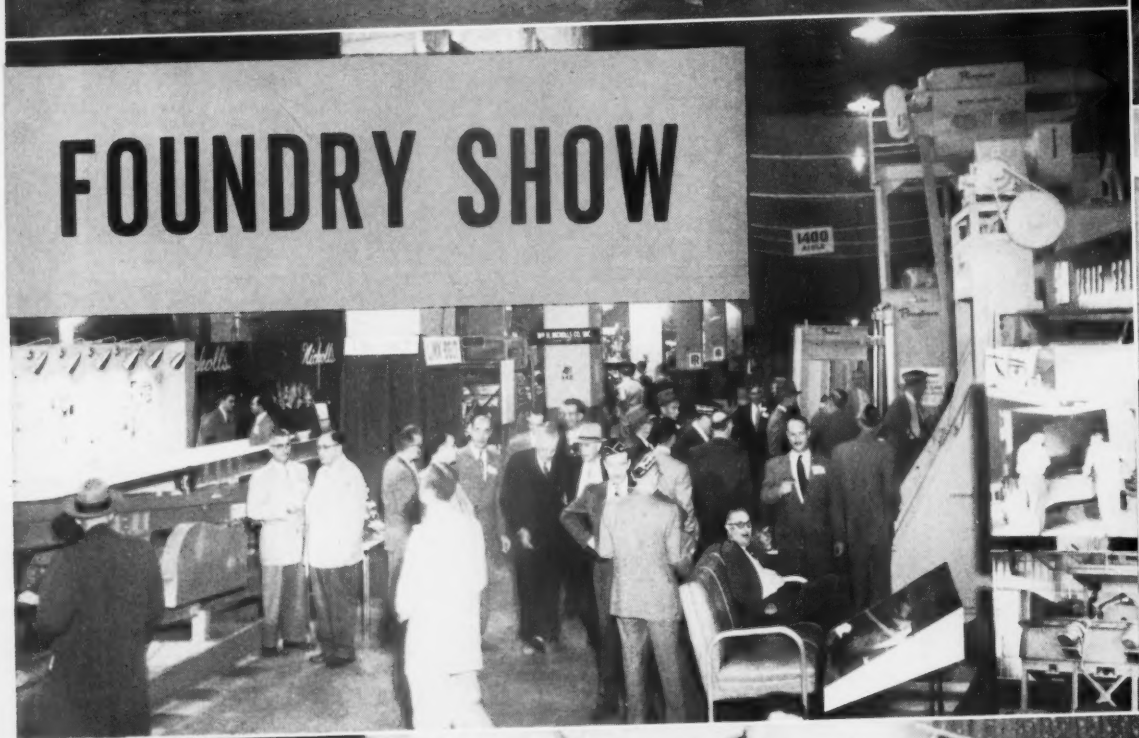
The lower level of the exhibition hall was especially impressive, with displays of tall, massive equipment, including a complete sand reclaiming system in operation, large displays of huge cleaning equipment, a core oven, and dust collecting equipment. Most of the techniques of display design were utilized to add to the attractiveness of the booths.

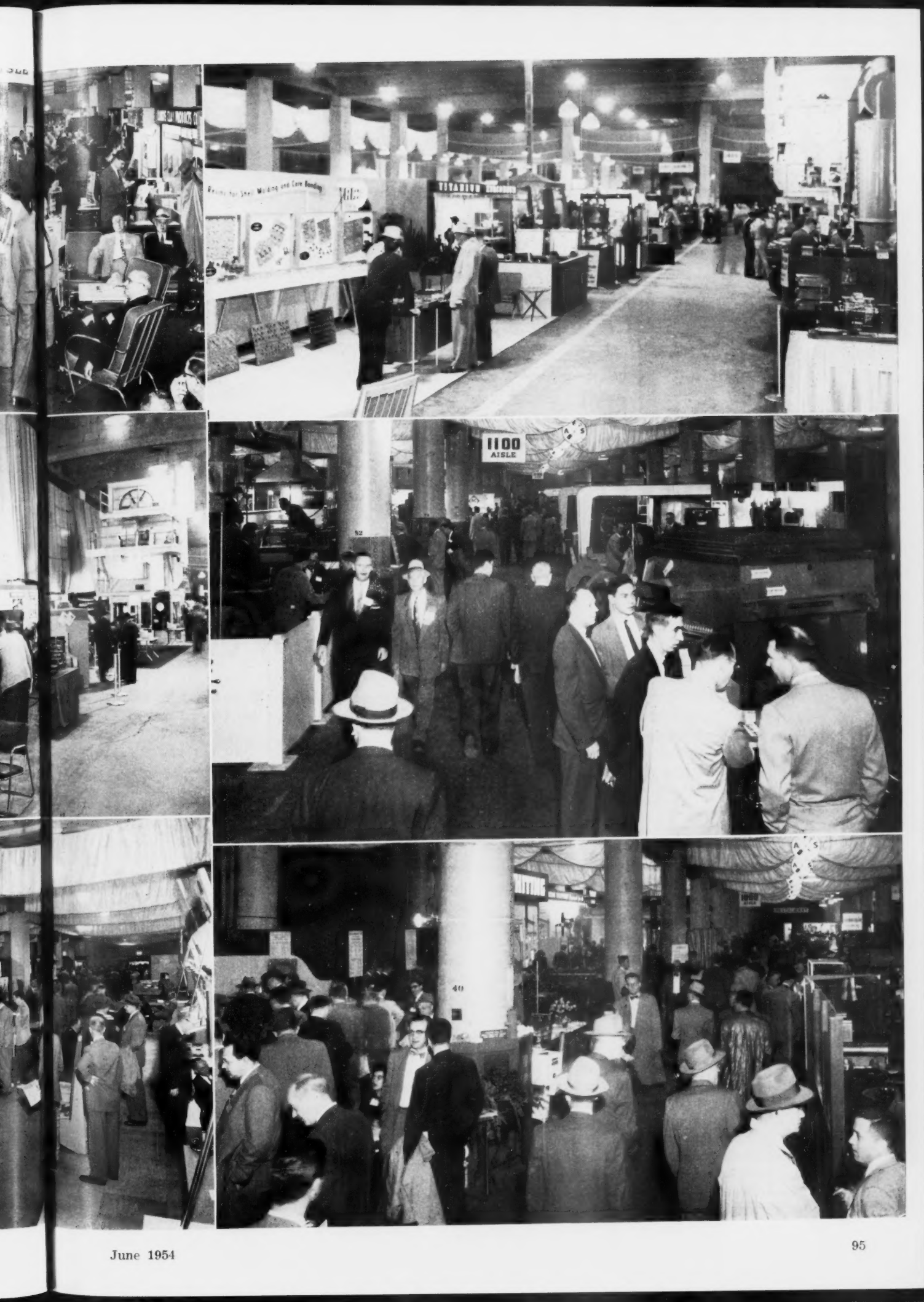
A number of machines produced by equipment manufacturers in several foreign countries were shipped here for display at the show.

The illustrations on this and the following three pages are aisle shots designed to give those who were unable to attend, a little of the atmosphere of the show. Space and time limitations prevent showing individual views of all of the interesting and valuable displays.

1400
AISLE
AIR REDUCTION

FOUNDRY SHOW

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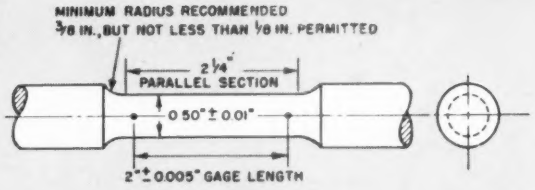


Fig. 1—Standard 0.505-in. bar is universally accepted now for use with copper-base alloys

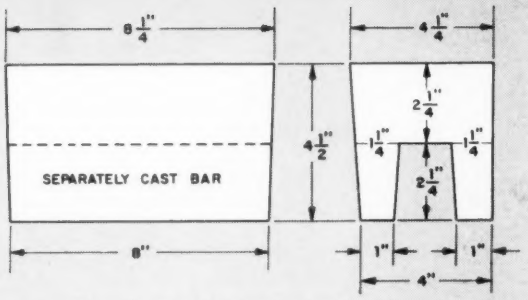
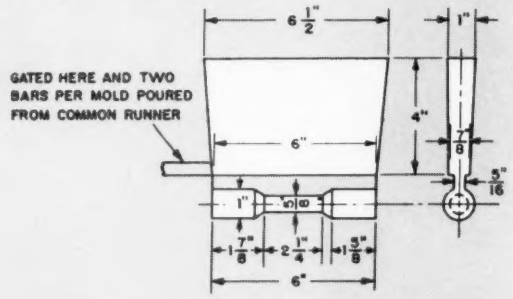


Fig. 2 (above)—Keel block design is used for short freezing range alloys. Fig. 3 (below)—Webbert bar is widely used machined test bar



TEST BARS .. for Copper and Aluminum Base Alloy Castings

This article is comprised of two parts, the first of which deals with test bars for copper-base alloys and is presented here. Part II covers bars for aluminum-base alloys and will appear next month

By ROBERT A. COLTON and DONALD L. LAVELLE

Federated Metals Division
American Smelting & Refining Co.
Barber, N. J.

Central Research Laboratories
American Smelting & Refining Co.
South Plainfield, N. J.

EVERYONE who deals with castings, from the foundryman to the ultimate consumer, agrees that some type of inspection is essential to maintain consistent quality of product. For this reason every foundryman inspects his own castings before shipping to a customer or before using them in his own manufacturing business. Often this inspection amounts only to visual examination of rough castings and rejection of those with obvious defects. Such methods prevent a large portion of unsatisfactory castings from ever leaving the shop.

Inspection procedures also may be more vigorous. X-ray, gamma-ray, Magna-Glow and Dy-Chek examinations may be used to measure quality. In the majority of cases, inspection techniques fall between the two extremes of visual examination and internal examination, such as with x-ray. Castings are machined, polished, plated and otherwise processed, and at each stage of the operation, more visual inspection takes place. Because the various operations remove metal from the casting, visual inspection becomes more efficient. Subsurface defects are revealed that were not visible in the as-cast condition. Castings are rejected more intelligently—and also more expensively.

A casting rejected in the foundry represents the *minimum* value of the particular piece involved. Each successive operation on that casting increases its value. Obviously, the economic course is to inspect the casting at its point of minimum dollar value, where rejection is least costly. This fact has been recognized only recently by the foundry and casting-using industries. As a result, many attempts have been made to design methods for inspecting castings before any further work is done on them, especially expensive and complicated machine work.

From such considerations has come hydraulic or pneumatic testing of castings that must withstand pressure in service. In some cases actual destruction tests have been used, but this usually requires machine work of some sort to put the casting into

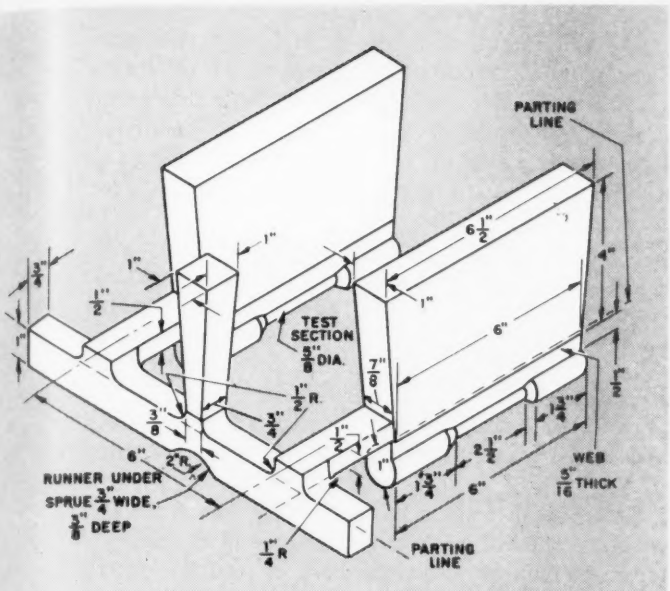


Fig. 4—Since it normally is desirable to have a duplicate of each test, two bars often are cast at once, as illustrated in this twin bar

a condition similar to that of actual service. A whole range of tests has evolved around various measurable physical properties of the casting, such as hardness, ability to withstand compression or tension loading and resistance to bending.

With the latter type of test, however, the emphasis of inspection begins to change from examination of the *casting itself* to measure of quality of the *material* from which the casting has been produced, and at this point an entirely new concept enters the picture—one which suggests that a casting can be inspected by comparing the quality of the material in the casting to some arbitrary standard established for that material.

Such comparison may involve no more than checking dimensions against a template or matching colors or, perhaps, measuring the hardness of the casting itself as compared to the hardness of a casting known to be satisfactory. Now these techniques are not illogical and do represent a test, after a fashion, of the quality of the casting itself. This idea is then extended to cover tests, not of the *casting,* but of the material when made into some predetermined shape that can be measured and compared. From such a concept came the idea of test bars which can be used to measure reproducible physical properties of the material from which the casting is made.

Perhaps the test coupon is bent in a special fixture or measured for hardness or broken and examined for fracture, texture and appearance. The test coupon may be machined into a standard shape and broken in a standard manner to establish certain properties such as tensile strength, yield strength, and elongation. It is this latter practice in which we are interested in this article—the practice of using a test bar—more properly called a tensile test bar—as a method of inspection of castings.

What a Test Bar Does—Undoubtedly the ideal test for a casting intended to be other than purely decorative is to put it into service and observe its behavior. When this is done the results have much meaning—the casting either stands up or it doesn't. However, relatively few castings can be tested in this fashion, especially those used structurally where the *strength* of the casting is important. Instead, we can test the strength of part of the casting and if that is satisfactory, assume the casting itself will be satisfactory. This test involves cutting up a casting and testing portions. Obviously, this course is practical only when sufficiently large numbers of castings are produced on the job so that destruction of a few can be justified economically. In most cases, however, with only a few—but perhaps very large—castings, this testing cannot be done.

Strictly speaking, examination of a section of the casting in some standard fashion is the next best technique after using the casting itself in service. By such a method an actual appraisal of the quality of the casting itself is available.

Cutting a tensile test bar out of a section of the casting and using the values determined from such a bar when it is broken in a standard fashion undoubtedly would be a logical and accurate way of assessing casting quality, provided that a satisfactory basis for comparison between the tensile properties observed and those considered adequate for that material was available. These standard tensile values obviously must be a true measure of the tensile strength of the material as it is present in a satisfactory casting of similar dimension and section size. This means that it is unquestionably unfair and inaccurate to compare the results from a test bar cut from a 1-in. section of a valve body or flange with tensile properties of the same material when the test coupon is taken from a 2-in. section of a pump housing.

It also is unfair and inaccurate to compare the tensile properties of the bar cut from the casting section with a bar made from a coupon cast separately and gated and risered in the best way known to make the coupon sound. Castings are usually gated and risered in order to produce the soundest, highest quality metal possible; but with complex shapes—the very shapes that *only* castings can produce economically—it often is impossible to gate and riser *all* parts of the casting equally well.

What, then, represents a fair value of tensile properties for various sections of any particular casting? Certainly not the results of a well gated test coupon cast separately. Exactly what values should be used as a basis for comparison can be determined only by cutting up a large number of castings (from any particular metal or alloy) gated and risered in a variety of ways and making test bars from variously sized sections throughout the castings.

These test bars would represent typical proper-

ties expected from the particular material in any specific section thickness. With a large number of such tests available it would be possible to select a range of values indicative of good quality. Such values then could be the accepted standard basis. Inspection of castings then would have significance since the test bar would represent the casting itself and would be compared to values obtained from castings.

Such data as needed to establish the standard values are not yet available and will require considerable expense and effort to accumulate. When such a program is carried out, a practical method of inspection will be at hand for many castings. Obviously, not all jobs can be approached in this fashion, especially where only one or two castings, particularly large and/or expensive ones, are involved. Since this fact was recognized long ago, an alternate practice has been developed with the hope that it will establish a satisfactory casting inspection method.

Written into many copper-base casting specifications today is the requirement that a test coupon be attached to a casting. The tensile values obtained from this coupon are compared to the standard values and are a measure of quality of the casting. In theory this solves the problem of eliminating destruction of castings and of inspection of the casting itself. In practice the technique leaves much to be desired. The fundamental problem is one of determining *where* the test coupon is to be attached. Tensile test results vary greatly, depending on the feeding of the coupon. Feeding of the coupon depends entirely on its placement on the casting.

It might be possible to determine where to add a coupon onto any particular casting to get optimum tensile properties, but the experimentation well may cost more than the casting itself. Because every job would have to be treated individually, the problem becomes virtually insoluble. Even if some standard position could be established for the test coupon (and just how this would be done is a problem of monumental proportions), data would have to be obtained for setting up standard values for quality. Needless to say, such data are not available.

In any alloy freezing over a wide or fairly wide temperature range, making a test coupon attached to a casting is technically unsound since size of section, availability of metal for feeding, extent of chill, etc., all contribute to the soundness of the attached coupon. Standardizing such a coupon appears to be a simpler problem with short solidification range material (manganese bronze, cast iron, etc.).

Attaching a coupon to the casting has some significance since there is a fair chance of obtaining a sound coupon almost regardless of position on the casting. As a result, the practice of casting attached coupons to manganese bronze propeller wheels gives results that can be compared fairly well to tensile properties obtained from separately cast, well fed coupons. This is the exceptional case, however, and does not change the basic premise that this is not a valid way to measure casting quality.

The remaining method of making test bars—casting them separately into standard patterns, gated in standard ways, is by far the most prevalent and the one that constitutes the greatest problem to foundrymen who must meet test bar inspection requirements.

Separately Cast Test Bars — This type is cast separately in a special mold and poured with the same metal used in the casting to be evaluated. Practically all federal, Navy, military, and engineering society specifications require or permit the

TABLE I—Test Bar Information for Some Common Copper-Base Alloys

Alloy	Nominal composition				Freezing range type	Specifications				Type test bar required	Pouring temperature range[2]
	Cu	Sn	Pb	Zn		ASTM	Federal	Military	SAE		
85	85	5	5	5	long	B145-49-4A	QQB691b-2	B16444	40	Webbert type[1]	1950-2050
83	83	4	6	7	long	B145-49-4B	.....	.....	..	Webbert type[1]	1950-2050
81	81	3	7	9	long	B145-49-5A	.....	.....	..	Webbert type[1]	1950-2050
M	87	6	1.5	3.5	long	B143-49-2A	QQ691b-1	C15345-A	622	Webbert type[1]	1950-2050
PC	87	8	1	4	long	B143-49-2B	QQ691b-6	C15345-A	621	Webbert type[1]	1950-2100
G	88	8	..	4	long	B143-49-1B	QQ691b-5	C15345-A	620	Webbert type[1]	2000-2100
88-10-2	88	10	..	2	long	B143-49-1A	.....	.....	62	Webbert type[1]	2000-2100
89-11	89	11	..	..	long	.....	.....	.....	65	Webbert type[1]	2000-2100
80-10-10	80	10	10	..	long	B144-49-3A	.....	.....	64	Webbert type[1]	1900-2000
		Si	Mn								
Everdur	94	4	1	..	long	B198-49-12A	QQC-593	... ...	..	Webbert type[1]	1950-2050
		Sn	Si								
Herculoy	91	1	4	4	long	B198-49-12A	QQC-593	.....	..	Webbert type[1]	1950-2050
Tombasil	84	12	4	..	long	B198-49-13A 13B	.....	.....	..	Webbert type[1]	1925-2025
		Al	Fe					B-16443			
Low Tensile	56	1	1	42	short	B147-49-8A	QQB-726C A	C15345-A	43	Keel block	1850-1950
Medium Tensile	64	4	2.5	Bal.	short	B147-49-8B	QQB-726C B	C15345-A B16522-2&3	430A	Keel block	1900-2000
High Tensile	61	6	3.5	Bal.	short	B147-49-8C	QQB-726C C	C15345-A B16522-1	430B	Keel block	1900-2000
Aluminum Bronze[3]	89	10	1	...	short	B148-49	QQB-671a	C15345-A B16033	68	Keel block	1950-2050

[1] This is the bar shown in Fig. 3 and may have either $\frac{1}{4}$ or $\frac{5}{8}$-in. web.
[2] The actual pouring temperature range used in the foundry should be narrower. The limits used must be determined in the foundry considering type of melting, amount of time required to move the metal, number of molds poured, etc.
[3] This is only a typical composition; all alloys use the same test block.

use of separately cast coupons. The majority of industrial casting specifications also provide for this type of coupon and bar. This is the test bar most familiar to the average foundryman. By definition, a test bar is a standard casting designed to give reproducible data concerning the properties of the alloy which will be indicative of the quality of the melt.

It is immediately apparent that the use of a separately cast coupon changes the emphasis from inspection of the casting to examination of the quality of the metal in the casting. This is an important difference and should be clearly understood by foundrymen, inspectors and specification writing agencies. What then is the purpose and value of a separately cast test bar coupon, and what do the results mean?

In view of the inherent difficulties of qualifying a casting directly, the approach took the direction of determining the quality of the metal being poured into the casting. This means not only the chemical composition, which usually must meet certain specific minimums and maximums, but also the skill and care with which the metal is melted and poured into a mold, which also must meet certain specific requirements with regard to casting design. Normally standard dimension tensile bars are machined from the separately cast coupons and broken on a tensile machine which yields values for tensile strength, yield strength and elongation.

Compare Values Obtained

The values so measured then are compared to arbitrarily chosen (standard) values. If the tensile properties meet the standard requirements, the castings under judgment may be accepted. If the tensile properties are below specification, the casting may be rejected.

The theory governing the use of separately cast test coupons assumes that if the tensile test bar meets the minimum requirements, the foundryman who has poured castings with the same metal has indicated the knowledge and skill necessary in melting and pouring to produce metal of a guaranteed quality. By inference, if the metal quality is adequate, castings poured with this metal also will be satisfactory, providing, of course, that they exhibit no visible defects. On such a basis, castings regularly are accepted or rejected.

Up to a point the theory in question is obviously sound. Certainly it is essential that the metal in a casting should be gas-free, clean and free from defects. The test bar does measure metal quality, but only remotely can measure casting quality. The reasons for this are apparent when it is realized that a test bar coupon is made from a well fed casting (if a standard design is used), whereas the casting poured from the same metal may be poorly or inadequately fed.

Since casting quality requires soundness of section and this characteristic requires adequate gating or risering, a good test bar cannot guarantee a good casting. This is not because foundrymen are

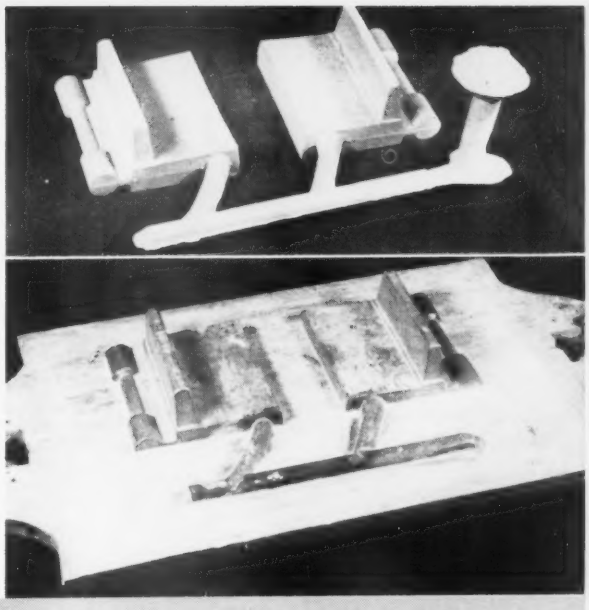


Fig. 5 (above)—Modifications have been made to permit mounting pattern on a matchplate

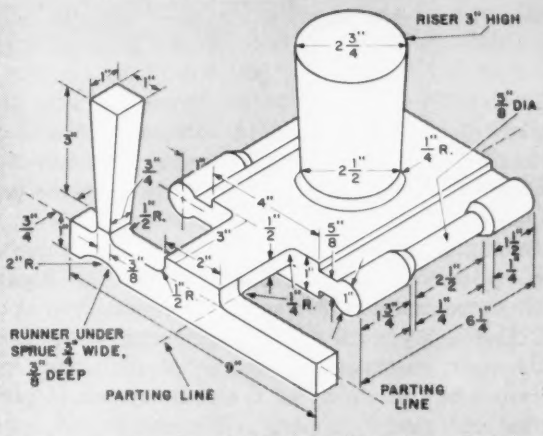


Fig. 6 (above)—Another modification of the basic Webbert bar design uses a center riser

Fig. 6A (below)—These views show matchplate mounting of the bar which appears in Fig. 6

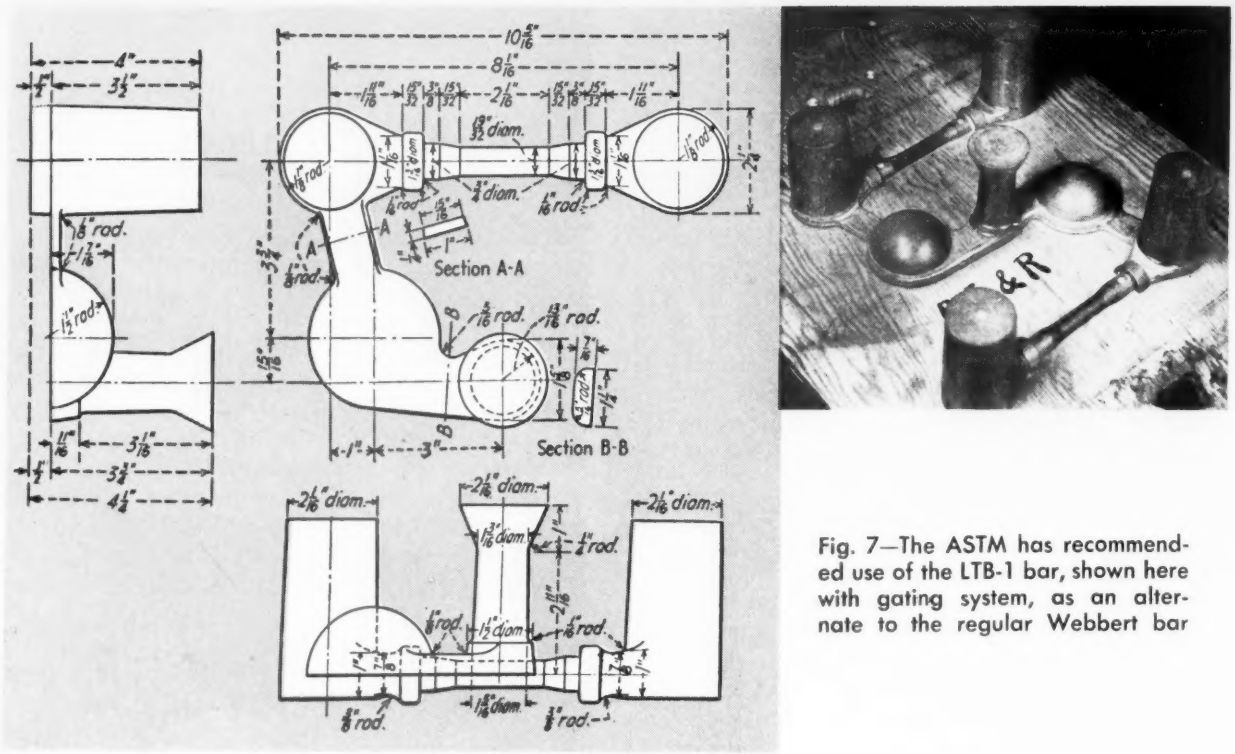


Fig. 7—The ASTM has recommended use of the LTB-1 bar, shown here with gating system, as an alternate to the regular Webbert bar

unskillful or negligent. The test bar designs are chosen to insure satisfactory feeding of the coupon section, and adequate risers are prescribed as part of the design.

Gating sometimes is left to the foundryman, but the options are few in placement of the ingate. With some castings, it often is impossible by nature of their designs to feed all sections adequately. With most castings, the degree of soundness is a measure of the ability of the foundryman to place gates and risers properly. No one would argue that foundrymen do not vary in their capabilities in this regard.

It is entirely possible for a foundry to produce excellent test bars and inferior castings. Satisfactory test bar results do not necessarily mean satisfactory castings, but they do indicate that certain minimum skills have been used and that the castings may be soundly gated and risered. Poor quality test bars do not necessarily mean poor quality castings, but it should be apparent that even if a casting is gated and risered correctly, the internal soundness of the casting may be inadequate if the metal poured into the mold is of low quality.

Separately cast test bars are, then, only a guide to casting quality, not an end in themselves. It is conceivable that a casting will be perfectly usable if gated and risered adequately, even if test bar results are below the minimum requirements. To accept castings on test bar results alone may be highly misleading; to reject castings on test bar results alone is safer, but may be unfair in that the casting itself may be of reasonably good general quality with regard to soundness of section.

What is needed is a common-sense approach to the problems by those responsible for accepting or rejecting castings by use of test bar results. With no other criteria available, separately cast test bars that meet the minimum specifications are probably a fair guide to casting quality, provided that it is realized that the casting involved could be of inferior quality to the test bars.

Test bar results far below the minimum requirements are probably just cause for rejection of castings. Test bar results slightly below the minimum requirements should not alone be cause for rejection of castings. It is possible that the general foundry practice used was good and that the casting itself is sufficiently sound to be used. Also, it should be remembered that the specification requirements are arbitrarily chosen values, and the very nature of tensile bars and the tensile test is such to suggest the use of careful judgment in these borderline cases. An experienced judge of casting quality usually can evaluate the ability of the foundry involved by other factors of importance equal to that of test bars.

Copper-Base Alloy Test Bars—In actual practice the theory and usage of test bars have kept pace. During the same period of time that better understanding came about concerning why test bars are used, the design of the bar itself and the method with which it is used have both made progress. This is not to say that either the theory or practice is yet satisfactory, but due to the efforts of specification writing groups, the problem at least has been approached in a more reasonable manner.

If the premise is accepted that the purpose of a test bar is to compare the metal quality to some arbitrarily accepted standard, it becomes essential that the tests or measurements be made in some prescribed fashion so that comparisons can be made of like things. To this end the design of the test bar coupon has evolved over a period of years to a

few basic types that are widely accepted, but which by no means are universally used. Much work remains to be done in standardization of bar design.

Before any discussion of test bar coupon design or manufacturing practice, it is worthwhile to define exactly the objectives sought. In order to make a reliable tensile test, it is necessary to have a bar or coupon with which to make the test. Universally accepted today for copper base alloys is the standard 0.505-in. bar shown in Fig. 1. Other sizes of tensile bars can be and are used, but for cast copper-base alloys this size is standard. The ends of the bar can be threaded, flanged or left as is, depending on what attachments are available for holding the tensile bar in the testing machine. The bar usually is cast oversize and machined to final dimensions.

Ordinarily, it is inserted in the machine vertically, gripped at each end and pulled apart by hydraulic, mechanical or dead loading. The center section of approximately 0.505-in. diam usually breaks somewhere near the geometric center of the bar. The breaking load, in pounds, divided by the cross section area of the bar before breaking (0.505-in. diam, 0.20 sq in. area) gives the tensile strength in pounds per square inch. In practice, if the bar is machined accurately, the breaking load in pounds times five (reciprocal of 0.20) gives the tensile strength in psi.

The elongation is measured by marking off a 2-in. portion of the 0.505-in.-diam section of the bar (called the "gage length") before the bar is pulled apart. This marking is usually done with a steel die, leaving small punch or "gage" marks for reference on the bar. After the bar has been broken, the two pieces are fitted together and the new distance between gage marks measured. The elongation then is determined by dividing the increase in length beyond 2 in. by two and is expressed as elongation in per cent in 2 in.

Yield strength is an arbitrarily defined property and is a measure of when the material begins to stretch in a nonelastic fashion. For loads up to the yield strength, metals act much like rubber, and if the load is removed, the material will return to its original length. Once the yield strength has been exceeded, the material deforms permanently.

The load value at which this change from elastic to inelastic behavior takes place can be determined with gages or by noting on the tensile machine the point where the bar stretches without corresponding increase in load. This load, in pounds, divided by the original cross-sectional area of the tensile bar (0.2 sq in.) gives the yield strength in pounds per square inch.

In general, the yield strength may be determined by two methods, one when a load vs. elongation graph is plotted and the yield strength obtained by the offset intercept method, and the other, known as the divider method, when the load is noted at a predetermined extension, or stretch, of the test bar which is observed by means of dividers. The divider method will give somewhat higher, less accurate results than the more refined method, but is suitable for routine work.

To get reliable, reproducible results from tensile tests, the test bars (*Please turn to page* 208)

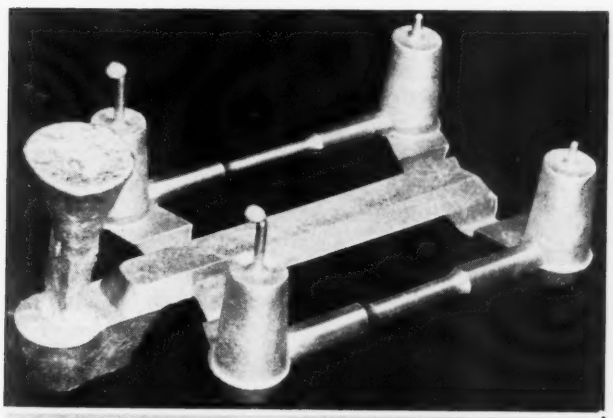


Fig. 8 (left)—Illustrating two-bar design widely used for aluminum, with good results

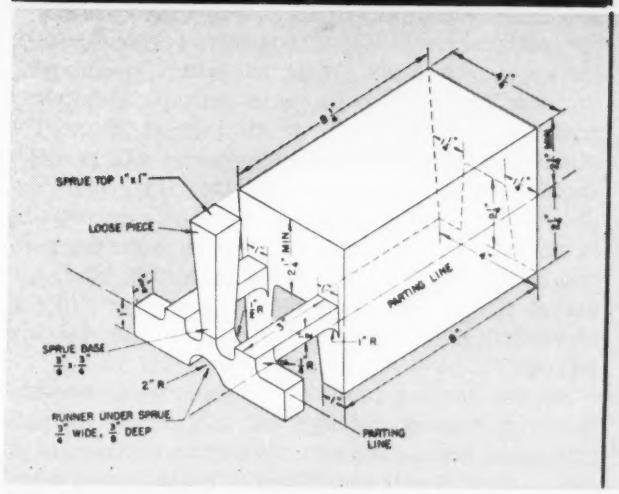


Fig. 9 (below, left)—Streamlined gating obtains best results with keel block type bars

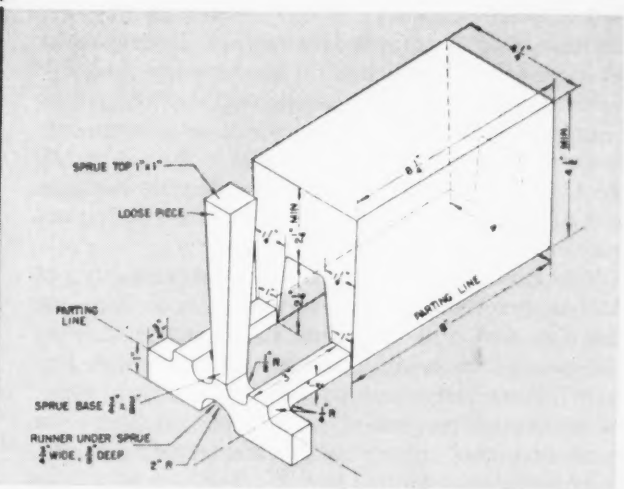
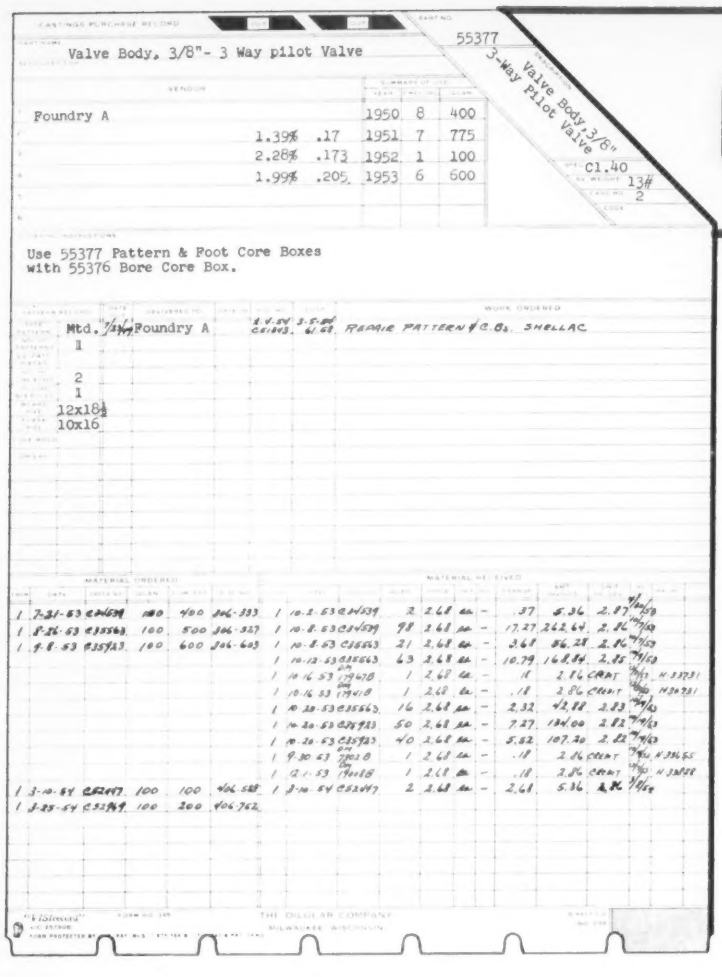


Fig. 10 (below, right)—This is an alternate gating system designed for keel block bars

Casting Buying



Co-operation and understanding are the key to successful relationships between producers and buyers, the author says. This article was presented before Wisconsin Chapter of the AFS at its meeting Mar. 12, 1954

Actual size of the casting purchase record card designed by the author's company is 8½ x 11 in.

THESE remarks are intended to present the viewpoint of a buyer of castings. It may seem unusual that a buyer who is neither a foundryman nor an engineer should hold membership in the American Foundrymen's Society, but attendance at many of its technical and general sessions have been helpful in providing a better understanding of the industry with which I deal.

It is likely that very few men directly engaged in the buying of castings are either foundrymen or engineers, or both. This probably is true because in most instances buyers find themselves in their position by virtue of circumstances. They either begin work in a purchasing department or are transferred to it from another department. If their plants use castings to any degree at all, they will, in time, find themselves buying castings and perhaps some related items; or casting buying may be only a portion of their work.

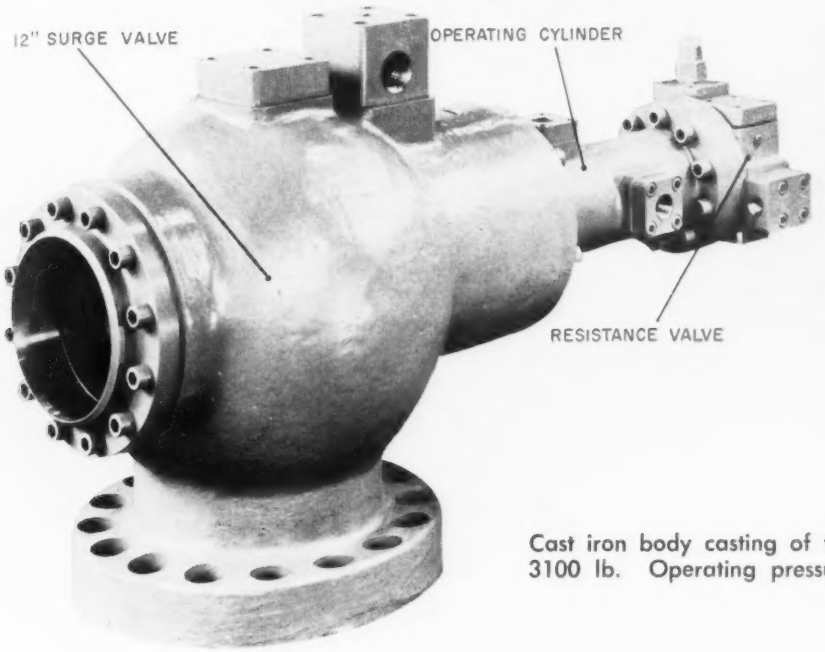
Types of casting buyers vary considerably, of course, from those who devote all their time to this function and buy from simple parts to very complex parts, down the scale to those who buy only occasionally and in small quantities—parts which generally present no unusual problems. In some instances today, the casting buying function is being placed in the hands of an engineer who is capable of coping intelligently with problems of design, quality and engineering, particularly some one with a good knowledge of both raw casting requirements and end use requirements.

The object of this discussion is to describe buying procedures—why buyers do what they do and what they think is lacking in the fulfillment of their efforts—and to show how they think the buyer and vendor can work in close contact with each other to promote a better understanding, all around, of common problems.

In the category of casting buying falls the type of buying in which a buyer looks at a requisition and, from whatever record is available, determines the pattern location and issues a purchase order for his requirements. What happens after the purchase order has been issued is perhaps a complete mystery to him because of his lack of knowledge of foundry techniques and processes; and perhaps such a background is satisfactory for this type of buying. The end use of the castings usually is such that very little of a problem exists with respect to quality. In situations of this kind, the actual buying is a perfunctory operation, and the placement of purchase orders is routine casting buying.

As the casting problem becomes more complex, however, more knowledge not only of the foundry processes, but of the end use of the castings is of increasing importance. When it becomes necessary

vs Buying Castings



By OSCAR P. KETTER
Oilgear Co.
Milwaukee

Cast iron body casting of this 12-in. surge valve weighs 3100 lb. Operating pressure of the valve is 3000 psi

to evaluate each purchase item, we also pass from the routine operation to the more specific function of buying castings. This is the field in which a buyer places orders for his requirements with a better than average understanding of the end use for the castings which he is buying. Here at least a basic knowledge of melting, coremaking, molding, core setting and cleaning becomes necessary. The extent to which this knowledge should be developed depends, of course, on complexity and quality of the parts required.

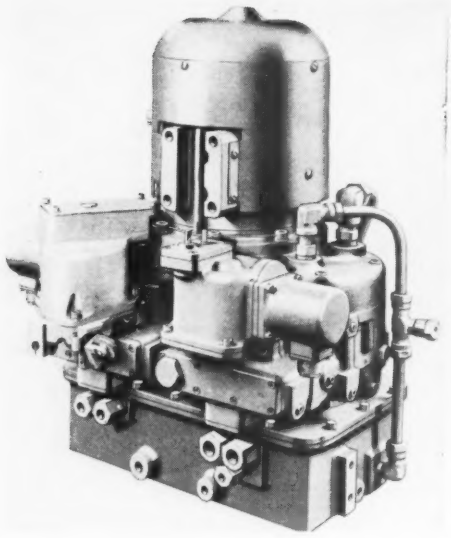
For all practical purposes, we can eliminate further discussion of the relatively simple matter of casting buying and go on to the study of buying castings. It probably will be interesting for the foundryman to know how a buyer analyzes his purchases; I would like to explain how we approach this problem.

As in any other phase of a business, it is necessary to maintain adequate records which provide the information necessary to assist in forming opinions and making decisions. We maintain a card record, reproduced here, for each item of castings we purchase. The card is our own design and has been drawn up, we feel, so that it meets all of our requirements and gives us a complete history of the part.

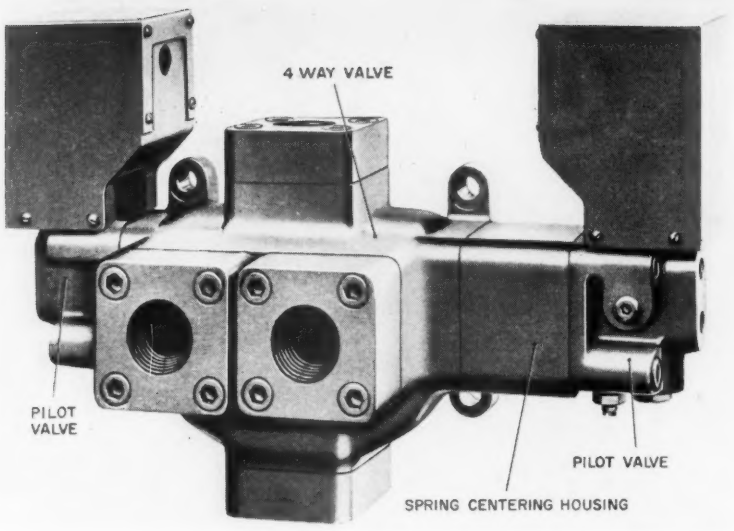
It provides space for the usual necessary information, such as the part number, the complete part name, material specifications and average weight. It also allows sufficient room for five vendors' names. We have inserted a small column for entering an annual summary of purchases which shows the number of times and in what quantity a part is ordered in a year. Ample room has been provided for listing ordering instructions, including any instructions necessary to assist in obtaining what we are ordering. We may find instructions such as "Cool in mold to room temperature," or, in the case of combination pattern equipment, "Use pattern number....with corebox number....for bore." These instructions are, of course, noted on the purchase order.

Below this we have built into the card a pattern record which lists the pattern equipment available to produce a part and a record of the movement of the pattern. We also have room to record work which is ordered on the pattern itself. This record is maintained and shows briefly what work was done and whether it was merely repairing and shellacking or a major engineering change. The balance of the front of the card and a good portion of the back provide room for entries concerning each purchase order issued, receipts and invoices and credits.

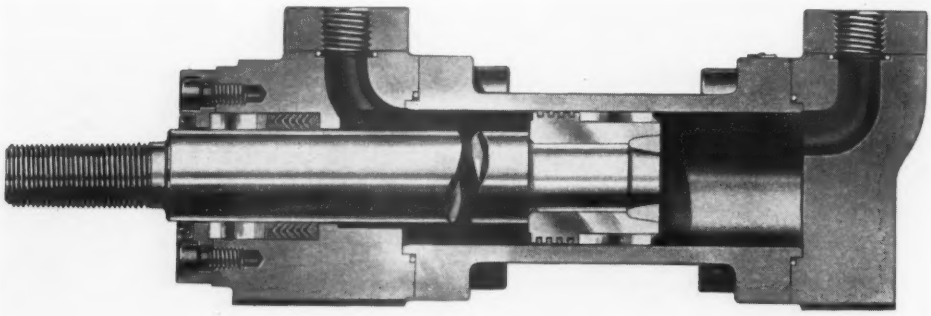
At the end of each year the purchases are added to the summary. Included in the summary is the scrap factor for the same period and the unit price and per-pound price. The scrap factor is based on the number of pieces either rejected and re-



Self-contained power pack units for tanks and howitzers contain 32 separate ferrous and nonferrous castings



Spring centered, three-position, four-way valve with two pilot valves operates at 3000 psi. Four-way valve body, pilot valve bodies and spring centering housing are gray iron



Cross section of 3000-lb hydraulic cylinder. Front and rear heads, piston and the seal housing are gray iron

turned for credit or rejected and reworked. This record has been developed so that a complete record of performance is available and the part can be purchased rather than ordered.

Defects are reported to us by the inspection department and relayed to the vendor by a letter and marked blueprint. These complaints are recorded in a fairly large space on the back face of the card. These complaints also are entered on the purchase order if they are fairly current. We believe that the card record which we maintain is complete and will permit us at any time, without referring to numerous other records, to analyze any part to determine the performance we are obtaining.

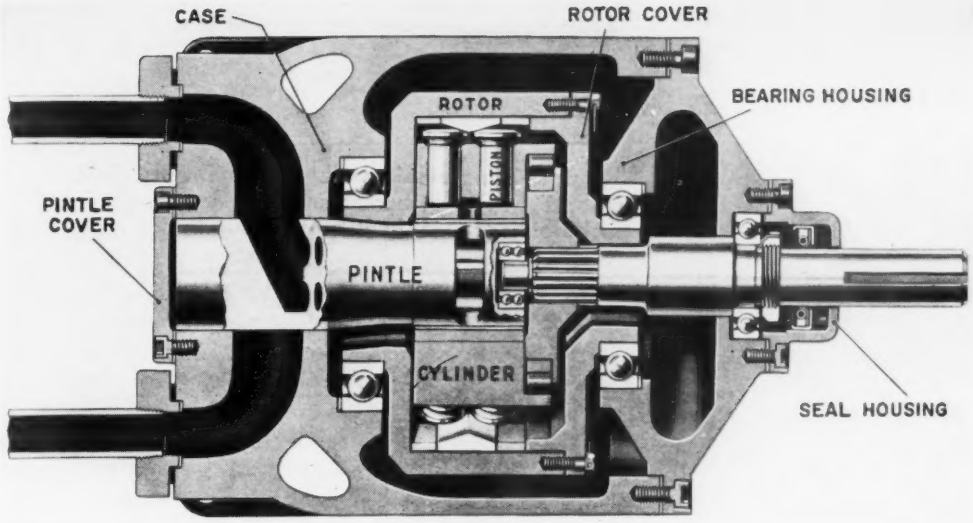
With this card record before us, we can approach the problem of buying. Upon receipt of a purchase requisition, this record is reviewed from the standpoint of cost and quality. Although current prices reflected in the record are satisfactory, they are checked with each requisition since this is one of the prime factors in which management is interested. We convert all prices to "as per-pound price," for easy comparison with similar jobs placed with different vendors.

When the job seems high in price, we review the job to determine a possible reason for its being high. The blueprint and the pattern record are checked to determine, for example, whether or not design is a factor which necessitates complex pattern equipment. In a situation like this we work with the vendor to find how the job can be simplified from his standpoint and then with our engineering department to effect the changes necessary to achieve lowered costs.

When the scrap factor is found to be high (we consider a factor of 2.5 per cent by pieces to be excessive), and particularly when it is a continuing item from year to year, we again check into complaints and available vendor comments. Notations on the back of the card help us to decide whether we will go along with the current vendor or whether the time has come to place the job with another. It should be noted that we do not switch jobs readily, but prefer to work out the problem with the current vendor. In any evaluation of scrap, we must, of course, make allowances for those jobs which, by their very nature, will be potentially high in scrap.

After reviewing these pertinent factors, any ordering instructions or comments regarding defects are noted on the requisition, and it is priced and processed for typing.

Although a record card gives necessary information on a specific part, some other means must be provided to evaluate (*Please turn to page* 285)



Cross section of Type C hydraulic pump. All items identified are gray iron except pintle and pistons. Covering and massive sections all are apparent

(All photographs are courtesy Oilgear Co.)

CASTING COST AND SCRAP ANALYSIS—MARCH 1953

GRAY IRON

Foundries	No. Pcs.	Total Weight	Av. Cost	Total Cost	No. Scrap Pieces	No. Items Scrap	Total Wt. Scrap	% Delvd. Scrap	% Delvd. Scrap Pcs.
A	1758	10791	.123	1323.93	..	..	....	....	....
B	....	.....	...	.....	..	..	....	....	....
C	1733	28320	.142	4014.64	..	..	....	....	....
D	6869	33508	.185	6228.52	79	21	4555	13.59	1.15
E	31	4322	.181	784.58	4	2	552	12.77	12.90
F	2390	85419	.151	12913.66	14	5	3597	4.21	0.61
G	17	15804	.189	3001.17	..	..	....	....	....
H	....	.....	...	.....	..	..	....	....	....
I	....	.....	...	.....	..	..	....	....	....
J	107	2892	.163	473.91	..	..	....	....	....
K	96	12185	.149	1815.77	..	..	....	....	....
L	2507	7635	.158	1206.28	8	2	241	3.16	0.32
M	7	272	.154	42.05	..	..	....	....	....
N	560	94225	.154	14521.82	10	6	6182	6.56	1.82
O	623	3412	.174	593.42	1	1	4	0.11	0.16
P	53	5434	.146	793.51	1	1	33	0.61	1.89
Q	18	8503	.214	1825.25	..	..	....	....	....
R	2	225	.172	38.81	..	..	....	....	....
S	397	16075	.234	3761.12	52	3	795	13.09	4.95
T	3189	18796	.152	2870.49	9	5	80	0.43	0.28
U	485	17718	.167	2968.76	1	1	88	0.49	0.21
	20732	365536	.162	59177.69	179	47	16131	4.08	0.86

MALLEABLE IRON

V	....	.....	...	.....	..	..	....	....	....
W	1042	1331	.238	317.57	..	..	....	....	....
	1042	1331	.238	317.57					

CAST STEEL

AA	10	384	.343	131.91	..	..	....	....	....
BB	357	2995	.434	1302.69	..	..	....	....	....
CC	5	327	.40	130.92	1	1	1	0.31	20.00
	372	3706	.422	1565.52	1	1	1	0.03	0.27

NONFERROUS

DD	847	5635	.648	3654.61	6	1	58	1.03	0.71
EE	8	73	.617	44.72	..	..	....	....	....
FF	40	313	1.07	335.65	..	..	....	....	....
GG	200	579	.64	370.56	..	..	....	....	....
HH	....	.....	...	.....	..	..	....	....	....
II	1595	2774	.523	1451.64	1	1	1	0.04	0.06
JJ	16	575	.59	339.60	..	..	....	....	....
KK	10	108	.622	67.23	..	..	....	....	....
	2716	10057	.623	6264.01	7	2	59	0.58	0.26
Patterns:	Acct. 210	1404.02							
	Acct. 8	648.92							
	Acct. 25	171.72							
	Acct. 27	6.75							
		2231.41							

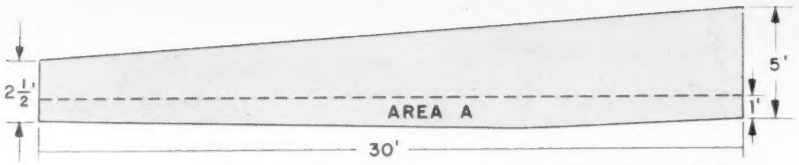


Fig. 1—Furnace side walls are 30 ft long, 5 ft above bottom at burner end, tapering to 2½ ft above bottom in front of the rear bridge wall

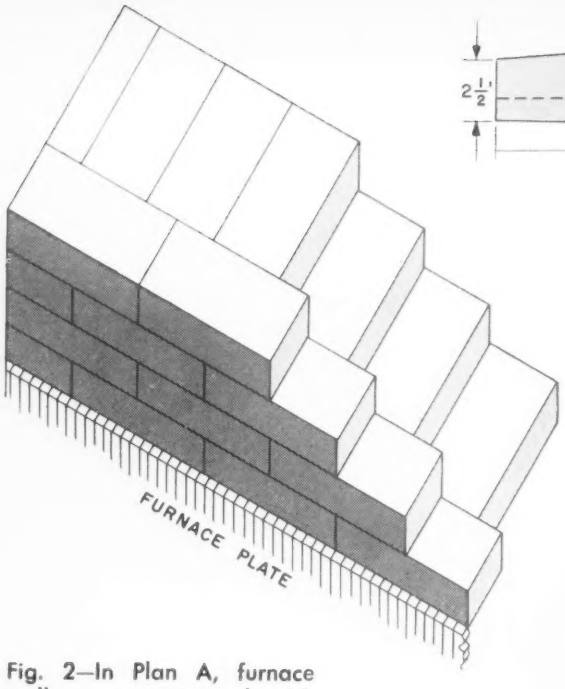
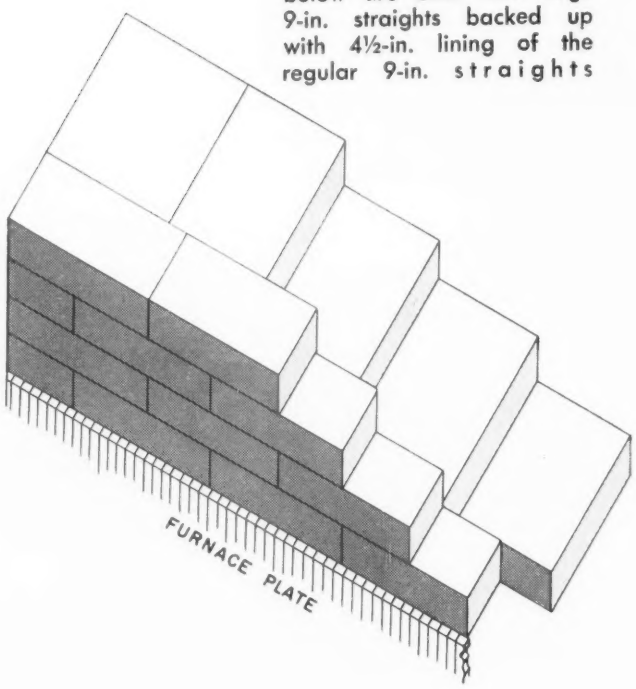


Fig. 2—In Plan A, furnace walls are constructed with the regular 9-in. straights

Fig. 3—Plan B side walls below are built with large 9-in. straights backed up with 4½-in. lining of the regular 9-in. straights



CUTTING REFRACTORY COSTS

in Producing Malleable Iron

Increased refractory life reduces the cost per ton of metal melted and is particularly important in the operation of malleable iron air furnaces, in which the refractory life is comparatively short

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REFRACTORIES represent an important cost and labor item in the production of malleable iron. It would seem reasonable that more interest should be developed and directed toward increasing refractory life and reducing the cost per ton of metal melted.

Some of the most severe conditions imposed upon refractories in the foundry industry are created in the malleable iron, batch-type air furnace, where refractory life is comparatively short. In some plants this condition is further aggravated because only one melting unit is available. Where this is so, full side wall life usually never is obtained, for whenever it is determined that the walls will not last through another full week, it becomes necessary to replace or repair these walls immediately in order to assure uninterrupted operation.

It must be remembered that each foundry has its own melting unit and that each of these units presents its own inherent problems. These may arise from operating conditions or from peculiarities of construction. Since not a great deal has been accomplished in standardizing air furnace design, refractories which meet every requirement necessary in one furnace may fail wholly or in part in another. Furnaces choked down in the neck and operating under a high back pressure produce greater fusion and erosion problems on side walls than furnaces which are not so designed and are being operated under slight or no pressure. Refractories not only must meet basic requirements, but also should satisfy the needs of individual melting units.

Let us review briefly the circumstances which side wall refractories encounter and what is required to combat these conditions. They must be able to withstand (a) high operating temperatures without excessive melting or fusion, (b) abrasion when the working face has become semiplastic through the effect of flame temperature, (c) slag erosion and (d) resistance to spalling or breaking from thermal shock.

TABLE I—Cost Comparison of Three Plans

Plan	Number of Heats	Refractory Cost	Labor Cost	Total Cost	Total Cost Per Heat
A	10	$313.92	$202.50	$516.42	$51.64
B	10	376.70	202.50	579.20	57.92
C	15	515.46	202.50	717.96	47.88

These conditions are best minimized at the present time by employing a refractory of high P.C.E., high density and correct chemical composition. Slag erosion can be reduced further by some simple program of slag control, such as frequent removal of slag and elimination of excessive oxidation of the metal, since oxides of silicon, manganese and iron are basic in nature and erode fireclay refractories readily. The number and thickness of brick-to-brick joints and the material used in these joints also are of importance. If the bonding agent is of lower quality than the refractory itself, and the joints are excessively thick, an initial weakness has been incorporated in the furnace lining which no refractory can eliminate.

It is assumed that operating heads of melting departments decide which type of refractory best suits their own needs, and no attempt will be made to dictate the kind to employ. After testing many different types and grades of refractories over a lengthy period of time, one was selected at our plant which most nearly incorporated the qualities necessary to meet our particular conditions. After this decision, experiments were carried out in an effort to determine what effect various types of wall and bottom construction and different refractory sizes would have on ultimate melting costs.

Until recently, large 9-in. straights were used in laying up the service lining of the side walls, with a 4½-in. backup lining of regular 9-in. straights. The large 9-in. straights were used mainly to obtain a lesser number of joints and to reduce still further the chance for erosion and metal penetration at the joints. Some saving in labor was realized, but not enough to offset the increased expense of the refractory. It was felt therefore that further cost reduction in some way was necessary, and a systematic survey of refractory cost, life, and operational factors was set up and followed closely, with the result that regardless of the variables which enter into refractory life in furnace side wall application, it was possible to increase the available life of the brick 33⅓ per cent.

The conventional air furnace side wall is usually constructed with a 9-in. service lining laid up with regular 9-in. straights and with a 4½-in. safety or backup lining of the same sized brick. It was observed that with this type of construction, and also when large 9-in. straights were used as the service lining, the fol- (*Please turn to page* 258)

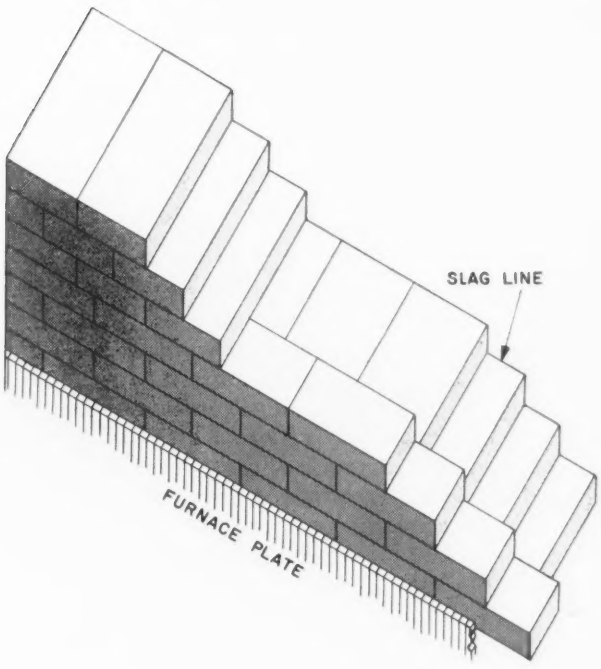

Fig. 4—In Plan C, side walls are constructed according to Plan B to just above slag line and then completed with 2½ x 6 x 13½-in. straights

Solidification, Feeding Characteristics Of Gray and Nodular Irons

Feeding practices applicable to gray iron are not applicable to nodular irons. This report correlates results of a series of related investigations concerned with specific features of solidification and feeding of these two metals in a practical analysis

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PRACTICAL, everyday problems of feeding castings to soundness by proper placing and dimensioning of risers can be solved by a direct approach based on scientific principles. This point has been demonstrated conclusively with steel castings, and many progressive foundries have applied these findings to practice. It should be recognized that extensive research and foundry trials were required to reach the present state of development. Similar scientific procedures and methods should be developed for iron foundry use.

An understanding of the process of solidification of irons and the related characteristics of feed metal flow is basic to any direct approach to feeding problems. In simple terms, a direct approach requires a background knowledge of "how" solidification and feed metal flow takes place and "why" various casting-to-riser conditions result in soundness or shrinkage.

This statement is particularly significant with respect to irons which long have been classed as anomalous in their feeding behavior. There is nothing anomalous in the processes of nature—iron castings are no exception, and any statement of anomaly with respect to feeding characteristics simply reflects an inadequate understanding of the natural processes.

The addition of nodulizing agents to gray iron melts has a profound effect not only in changing the shape of the graphite from flake to spheroidal, but also on solidification and feeding characteristics. Because of this, feeding practices which are applicable to gray iron are not applicable to nodular irons. The differences in feeding characteristics of gray and nodular irons result from characteristic differences in the conditions of feed metal flow, which in turn result from basic differences in the natural processes of solidification of the two metals.

It is the purpose of this report to correlate the results of a series of related investigations concerned with specific features of solidification and feeding of these two metals into a generalized analysis of practical significance. This information provides "how" and "why" knowledge about many "anomalous" features of gray and nodular iron behavior.

Microfeatures of Solidification—The process by which liquid iron changes to a solid consisting of a metal matrix with graphite flakes or spherulites may be considered the microfeatures of solidification. The transformation characteristics of gray iron have been studied by Boyles[1] and Eash[2].

These investigators determined that liquid gray iron transforms in the range of the liquidus to eutectic temperatures by the formation of primary austenite dendrites, if hypoeutectic in composition, or by the formation of primary graphite flakes if hypereutectic. The development of the primary structures results in a carbon enrichment of the remaining liquid in hypoeutectic irons and in impoverishment in hypereutectic irons. Thus the liquid approaches eutectic composition with decreasing temperature. When the eutectic temperatures are reached, the transformation is continued by the simultaneous formation of austenite and flake graphite structures or by reaction to austenite and iron carbide structures.

The nature of the eutectic reaction is determined both by the rate of heat extraction, which if fast favors the formation of carbide, and by the presence of elements which either favor or preclude the formation of carbide. In any case, undercooling is prerequisite to the formation of carbide structures. The conventional flake structures in commercial Fe-C-Si alloys form over a narrow eutectic reaction range rather than at a fixed temper-

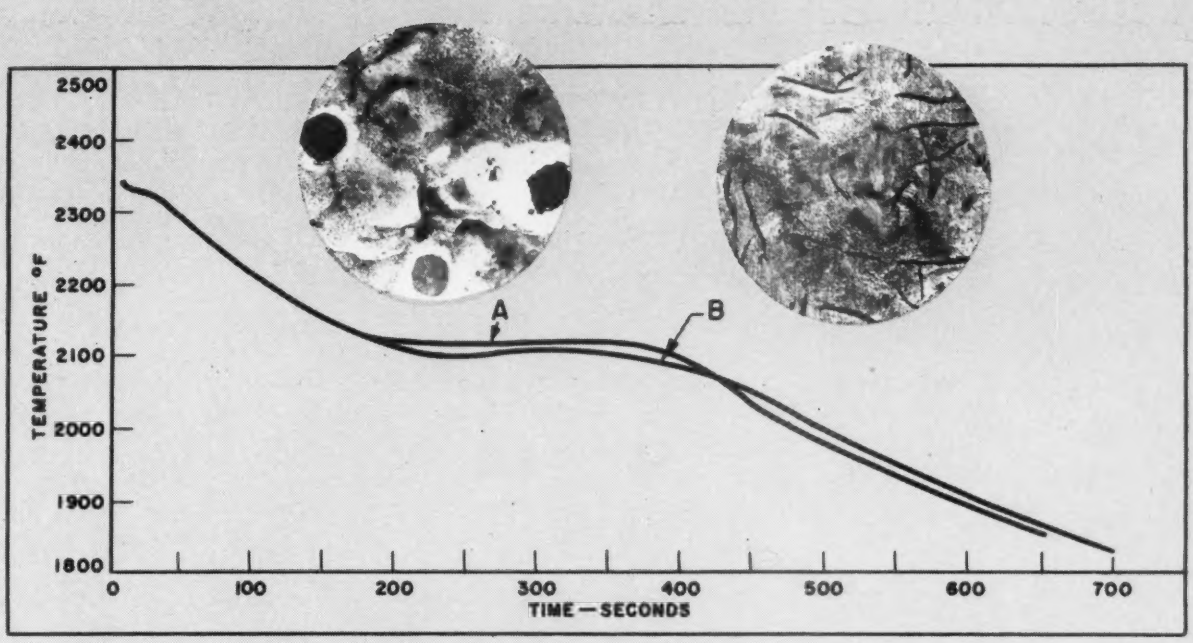


Fig. 1—Cooling curves for center of sand-cast, 2-in.-diam cylinders of hypoeutectic iron (2.63 per cent C, 2.21 Si, 0.21 Mn) with (B) and without (A) nodulizing magnesium treatment. 300X

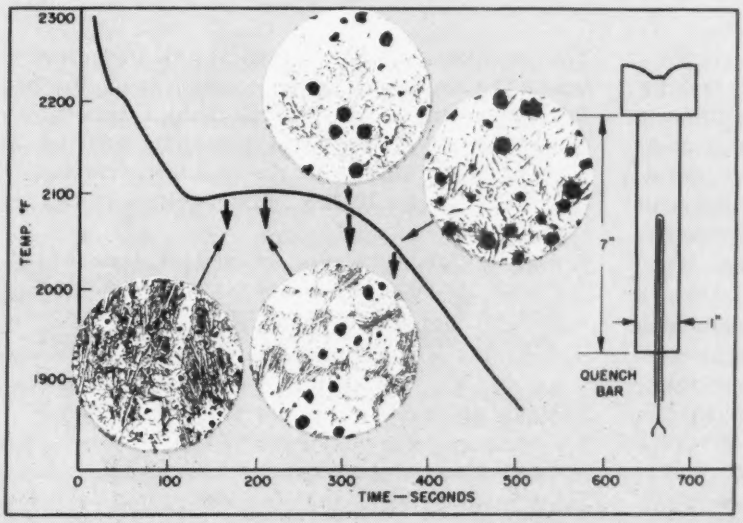


Fig. 2—Microstructures of samples of magnesium treated iron (3.01 per cent C, 2.40 per cent Si, 0.47 per cent Mn) quenched at various times during the eutectic reaction. 300X

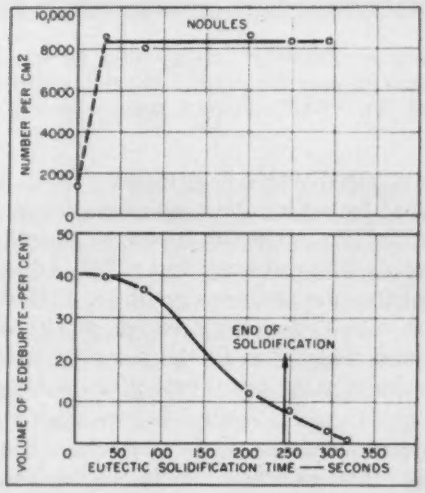


Fig. 3—Nodule counts and carbide volume at various times during the eutectic reaction. This is the nodular iron which is shown in Fig. 2

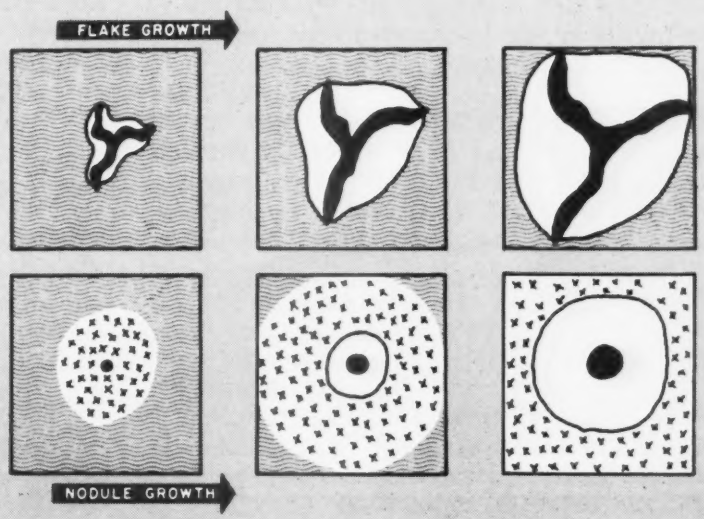


Fig. 4—Schematic illustration shown at right depicts growth of flakes and nodules during the eutectic reaction

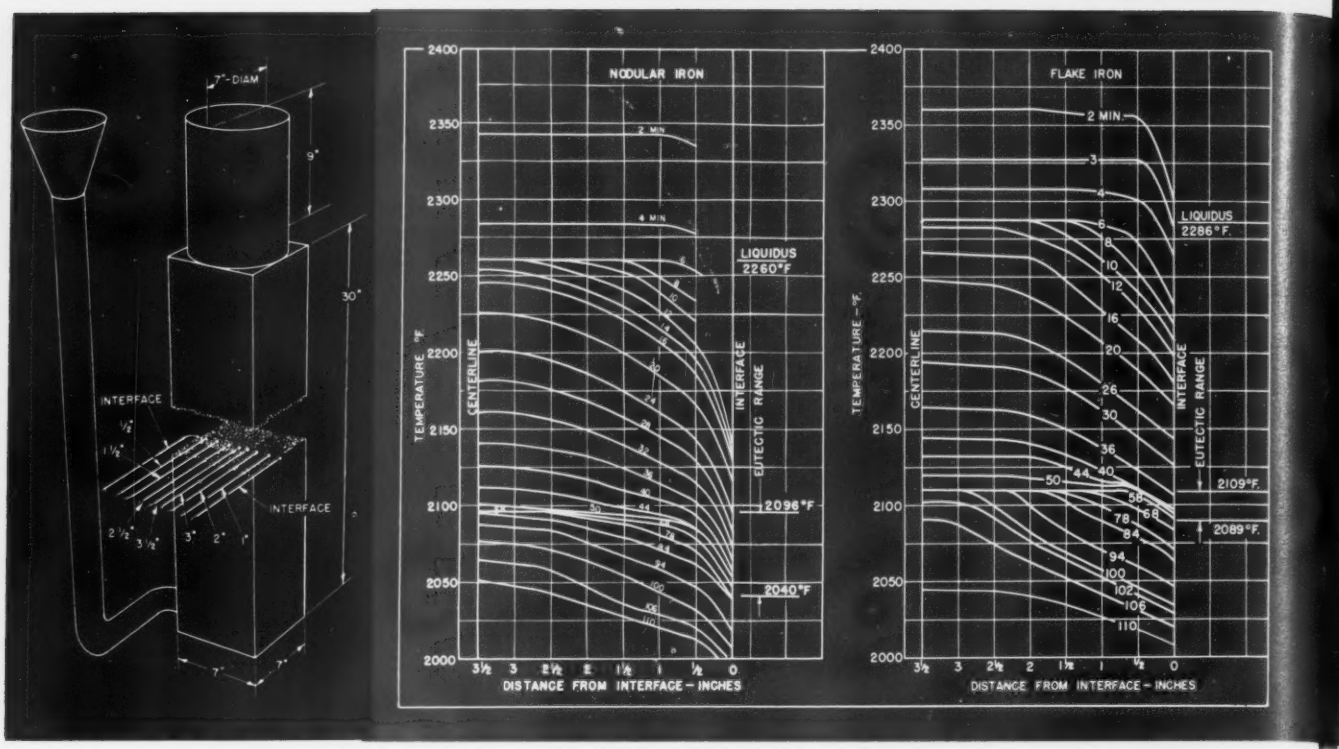


Fig. 5—Details of casting and thermocouple assembly used for studies of wall growth features of the solidification of gray and nodular irons

Fig. 7—Replot of cooling curve data in Fig. 6 gives the temperature distributions in the bar castings at various times during solidification

ature, like the pure Fe-C alloys.

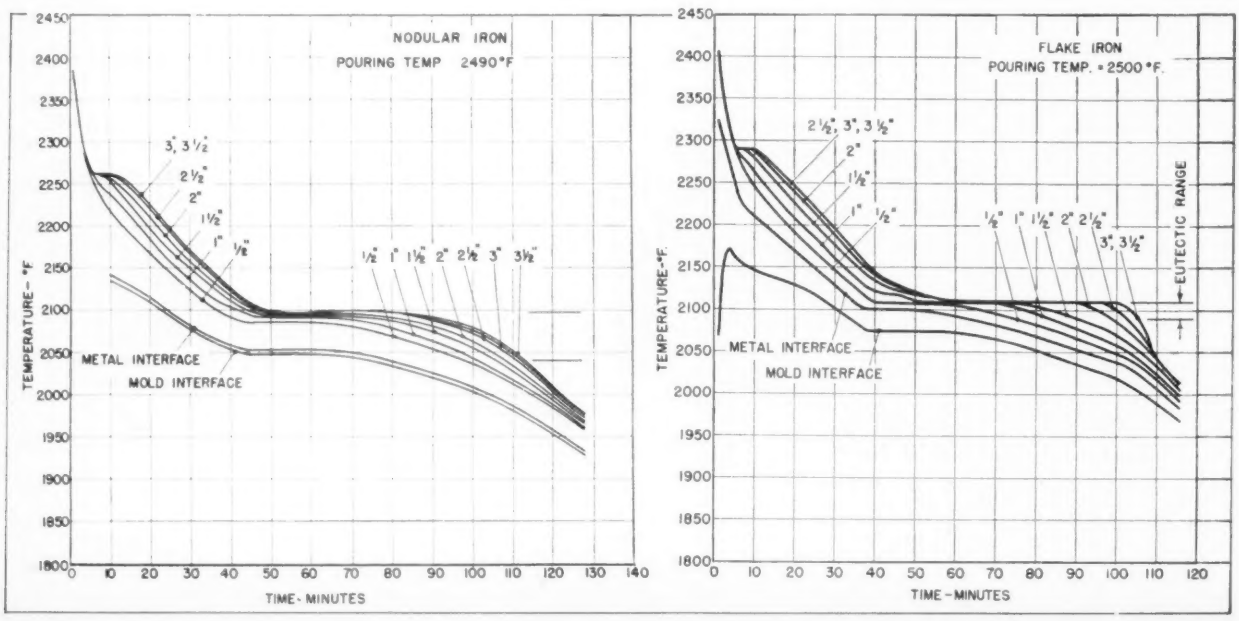
The transformation characteristics of nodular iron in the range of liquidus to solidus are the same as those of gray iron; that is, either primary austenite dendrite or graphite phases are developed with consequent change of the liquid to eutectic composition. In the primary graphite phase, the shape is spherical rather than flakelike.

Fig. 1 illustrates typical cooling curves for a hypoeutectic iron with and without a nodulizing magnesium treatment. It is observed that the cooling curves superimpose in the temperature range of austenite dendrite formation (2325° to 2115° F). The nodular iron curve then shows undercooling below the flake iron eutectic and a more gradual fall at the end of the eutectic hold. These differences suggest a change in the characteristics of eutectic formation due to the nodulizing treatment.

In order to study the characteristics of the eu-

Fig. 6—Cooling curves at various surface-to-center positions recorded during solidification of 7 x 7-in. bar castings of hypoeutectic nodular and gray irons composed as follows:

	%C	Si	Mn	C. E.
Nodular iron	2.87	2.24	0.49	3.62
Flake iron	3.04	1.39	0.53	3.50



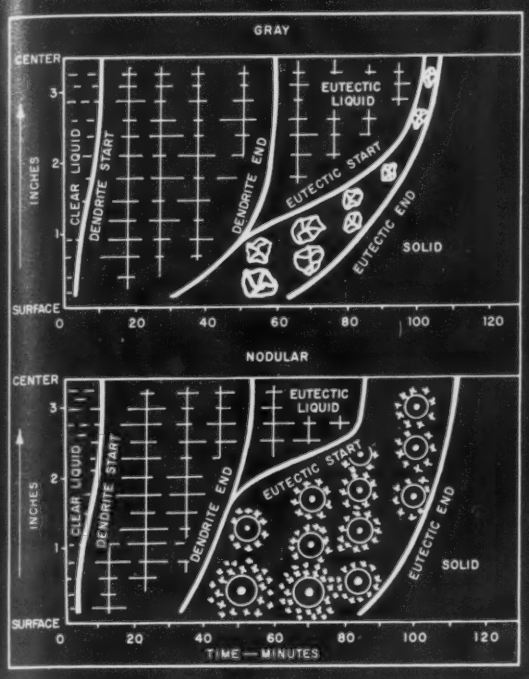


Fig. 8—Solidification curves for the two irons plot progression of solidification from surface to center as the movement of waves of freezing

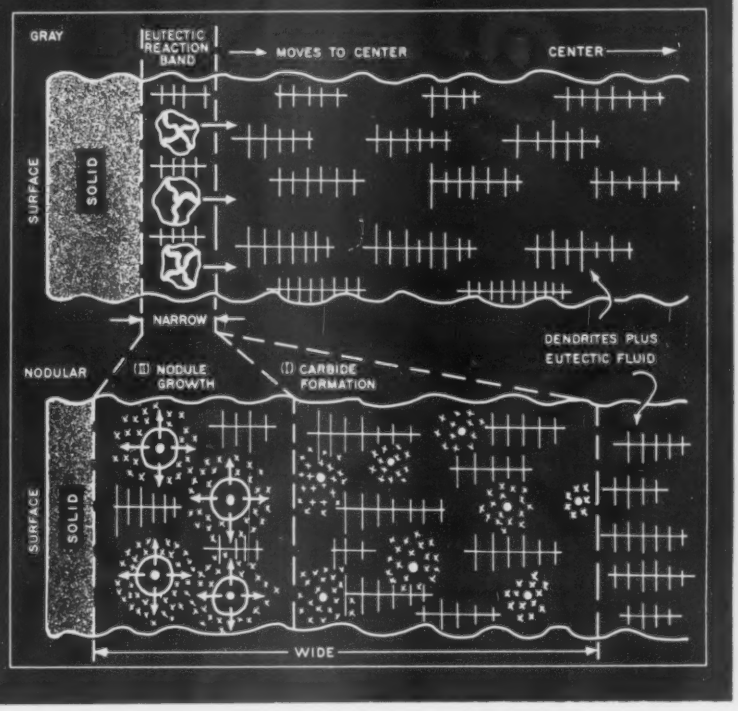


Fig. 9—Schematic comparison of microfeatures of eutectic solidification and wall growth features of the two irons shows their differences

tectic reaction of nodular irons, small castings were quenched at various times during the period of eutectic reaction and were examined metallographically[3]. The quench samples were poured into 1-in.-diam, 7-in. long cavities in cellular firebrick. A number of such castings were poured from the same heat and quenched into water at various times with simultaneous crushing of the firebrick. Each casting contained a thermocouple to establish accurately the quenching time with respect to the eutectic hold period. Fig. 2 illustrates a typical test series.

Samples quenched in the liquidus to eutectic temperature range showed only primary austenite dendrites in a matrix of carbide structures. Samples quenched during the period of eutectic hold showed that small nodules first appear at the start of the eutectic hold and grow in size as the eutectic reaction proceeds. At the same time austenite rings develop around the nodules, and the amount of carbide structure decreases.

By counting the number of nodules and measuring the area of carbide structures in the quench samples, investigators obtained data of the type shown in Fig. 3. These various data indicate that the number of nodules is fixed at the start of the eutectic reaction and that during the eutectic reaction the nodules grow in size while the amount of carbide structure decreases.

It was concluded that the eutectic reaction of hypoeutectic nodular iron occurs in the following sequence: 1. Undercooling occurs below the normal flake graphite eutectic temperature with the development of localized regions of supersaturation which provide for the precipitation of primary graphite as small spherulite particles. Thereafter, no new spherulites are formed since the supersaturation conditions are relieved. 2. Because of undercooling, the eutectic liquid transforms to carbide structures which are metastable and decompose, liberating carbon which diffuses to the small spherulite "seeds," causing these to grow in size.

The differences in the eutectic reaction characteristics of flake graphite and nodular irons are illustrated schematically in Fig. 4. It should be noted that the growth of the low density graphite phase occurs in contact with liquid in gray iron and in solid carbide structures in nodular iron. These deductions are basic to the understanding of the feeding characteristics of the two irons, as will be discussed in later sections.

Wall Growth Characteristics—The phase transformations described in the previous section occur at the response of falling temperatures; hence, all positions in a casting undergo the same changes as the temperature falls through the temperature ranges of liquidus to eutectic and then from eutectic to solidus. The timing of each change at any given position is determined by the rate of temperature drop, which is a question of heat transfer conditions. Obviously, the rate of heat transfer and the consequent temperature drop are faster at surfaces than in central regions of castings; hence the phase transformations will occur first at surfaces.

Placing a series of thermocouples across the thickness of a casting makes it possible to follow the temperature changes during freezing and thereby to establish the time of phase transformation at various surface to center positions. Fig. 5 illus-

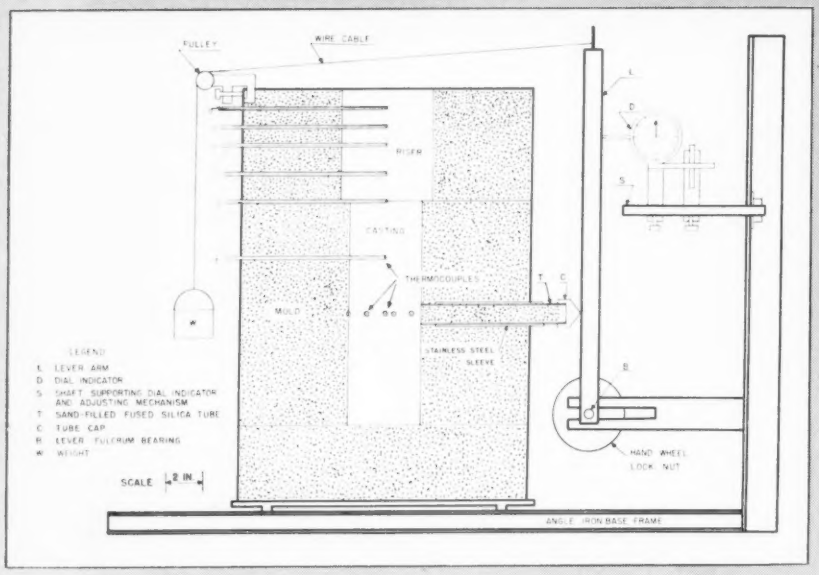


Fig. 10—Illustration of the principal features of the solidification dilatometer developed to conduct dilation studies

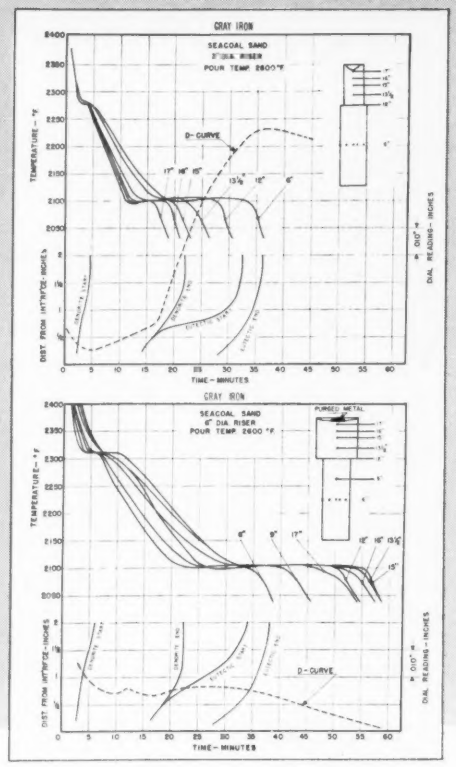


Fig. 11 (right)—Relationship of casting dilation characteristics to casting and riser solidification conditions (gray iron)

trates the type of casting and thermocouple assembly used for studies of wall growth features of solidification of gray and nodular irons. The wall growth studies covered a wide variety of compositions, effects of superheat and mold variables[4][5].

Fig. 6 illustrates the type of cooling curves which were recorded at various surface-to-center positions for gray and nodular hypoeutectic irons. The sequence of temperature fall with respect to casting position is evident in the spacing of the curves. The shapes of the individual curves follow closely the pattern deduced previously to be characteristic of nodular and gray irons, Fig. 1. That is, they show no significant differences in the range of liquidus to eutectic temperatures, followed by the characteristic undercooling and gradual fall of the eutectic reaction portion of the nodular iron cooling curves.

The conditions of solidification at various times are more readily evident when the cooling curve data are plotted as temperature distributions in the casting, Fig. 7. Each curve designates the temperature conditions across the casting at a specific time. The following sequence of events is indicated by the fall and change of shape of these curves:

1. The rapid elimination of superheat—within six minutes all positions in the casting are at the liquidus temperature (both irons).

2. The development of a liquidus hold at the central regions of the casting while austenite dendrite growth begins at the surface and then sweeps inward in a wavelike fashion to the center (both irons).

3. The general growth of dendrite structures throughout the casting. This growth results in a decrease in the amount of interdendritic liquid and in the enrichment to eutectic composition which is prerequisite to eutectic reaction (both irons).

4. The inward sweep of eutectic solidification waves through the interdendritic liquid of eutectic composition. During the progress of eutectic solidification at near surface positions the dendrite reaction is completed at all positions. This condition results in the development of a eutectic hold across the major portion of the casting since the temperature in the central regions cannot fall until the eutectic reaction wave reaches these positions (both irons).

5. The development of eutectic freezing across the section occurs in highly progressive fashion for gray iron, with each position rapidly changing to solid in turn, and in slightly progressive fashion for nodular iron, with all positions gradually changing to solid.

These qualitative observations may be presented in quantitative terms by plotting the progression of solidification from surface to center as the movement of waves of freezing. Four such waves are developed, including "start" and "end" waves for dendrite formation and for eutectic reaction. Fig. 8 presents the solidification curves for the two irons.

It may be observed that the dendrite start wave traverses the casting rapidly; after 12 minutes, dendrite formation is occurring at the center. For a period of approximately 20 minutes thereafter, the dendrite structures continue to grow, reducing the amount of liquid and causing carbon enrichment of the liquid to eutectic composition. At approximately 35 minutes, the process of dendrite

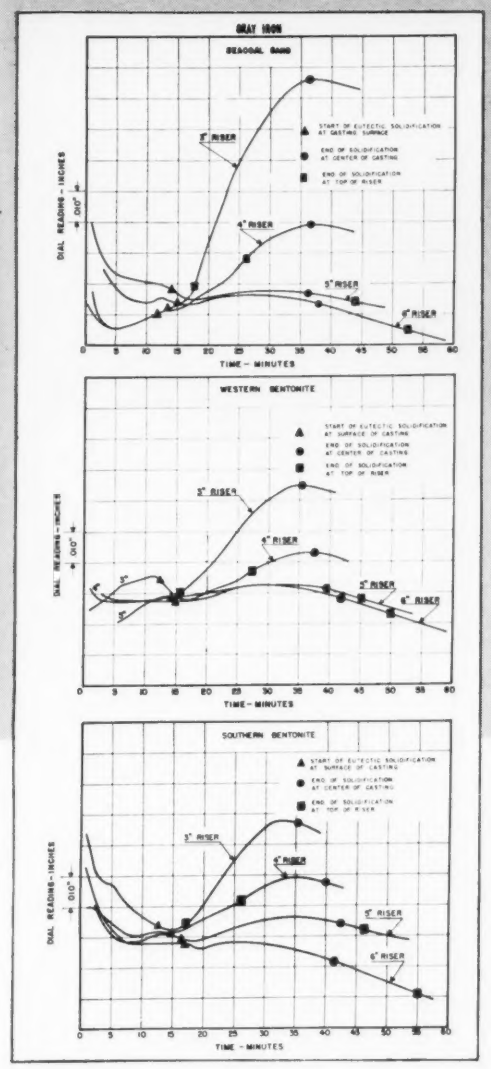


Fig. 12—Summary of gray iron casting dilation curves correlated with casting and riser solidification conditions

Fig. 13—Showing the purging of 4 x 4 x 12-in. castings as a function of riser size, using 3, 4, 5 and 6-in. diam risers

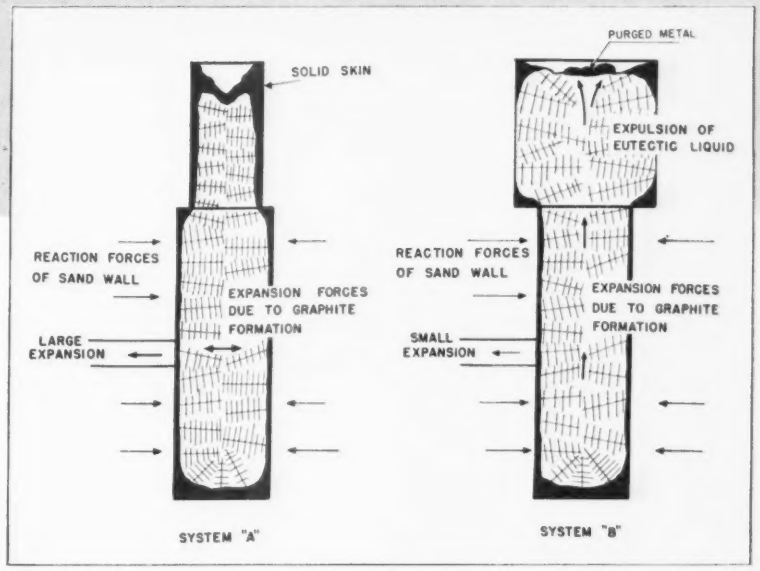


Fig. 14—Schematic representation of effects of graphite formation, capped and open gray iron castings

growth is completed at the surface as represented by the movement of the dendrite end wave away from the surface. The movement of this wave is very rapid, and at approximately 55 minutes both irons complete the process of dendrite growth at the center.

Eutectic reaction starts at the surface as soon at the dendrite reaction is completed. At the center, a delay in the start of the eutectic reaction occurs while the eutectic reaction progresses from the surface. This is similar to the delay corresponding to the liquidus hold. With the gray iron, the eutectic reaction is of narrow band type—that is, the two waves of eutectic freezing, "start" and "end," move toward the center with a narrow separation. The nodular iron eutectic reaction is of broad band type: The start of eutectic freeze wave moves outward rapidly, and the end of the freeze wave lags. As a result, the eutectic reaction of nodular iron spreads out over the major portion of the casting cross section. The solidification of both irons is completed at the center at approximately 105 minutes.

When the microfeatures of eutectic solidification and the wall growth features are considered together, the full extent of the differences in the process of eutectic freezing of the two irons becomes evident. This variation is illustrated schematically in Fig. 9. For hypoeutectic irons, eutectic freezing progresses through a clutter of previously formed austenite dendrites. With flake iron, the eutectic reaction band is narrow. Within this band, eutectic liquid transforms directly to austenite-flake graphite aggregates; the resulting expansion may be relieved partially by the outward displacement of the contacting liquid, as indicated schematically by the arrows of the figure.

In the nodular iron, the eutectic reaction occurs almost generally throughout the casting. The initial step in the transformation of each region entails the development of carbide structures which then, as a second step, decompose to austenite

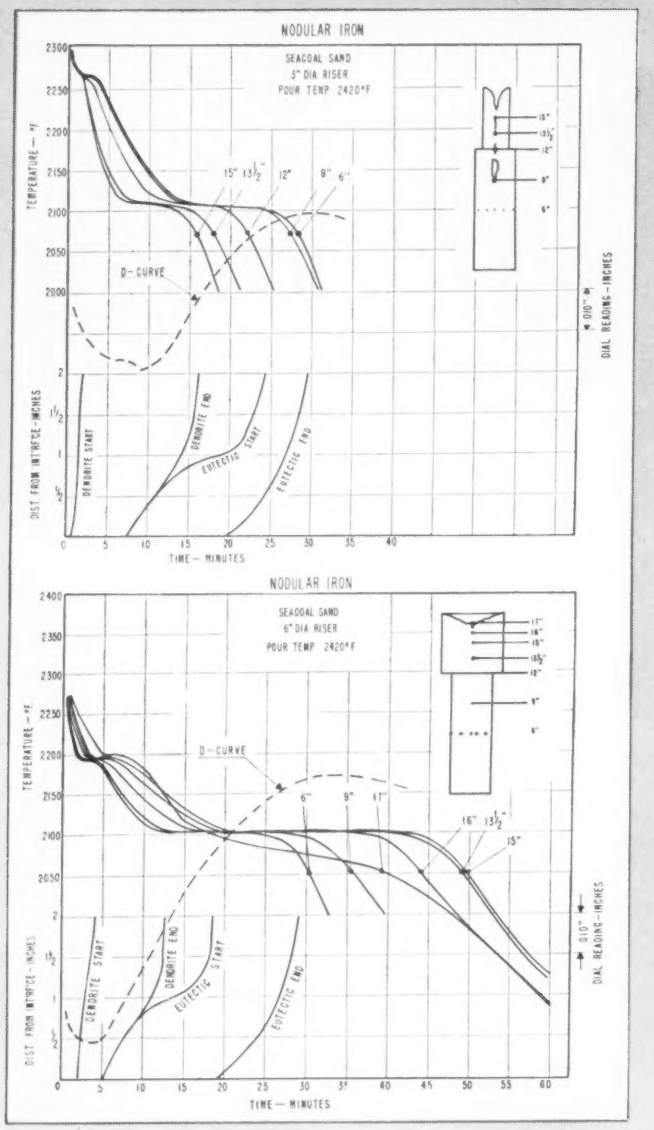


Fig. 15—Relation of casting dilation characteristics to solidification conditions of casting and riser for nodular iron of equivalent composition

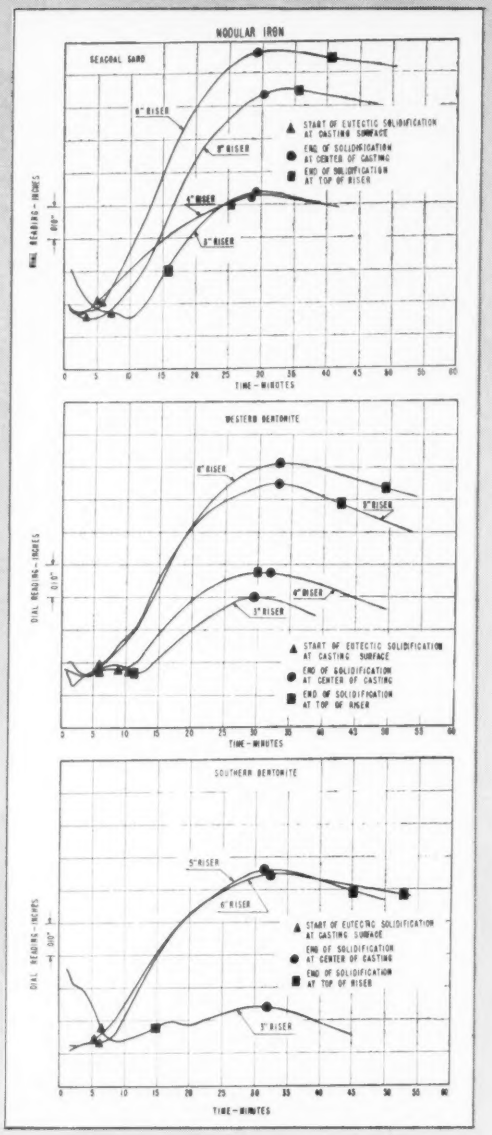


Fig. 16—Summary for nodular iron of casting dilation curves as correlated with the casting and riser solidification conditions

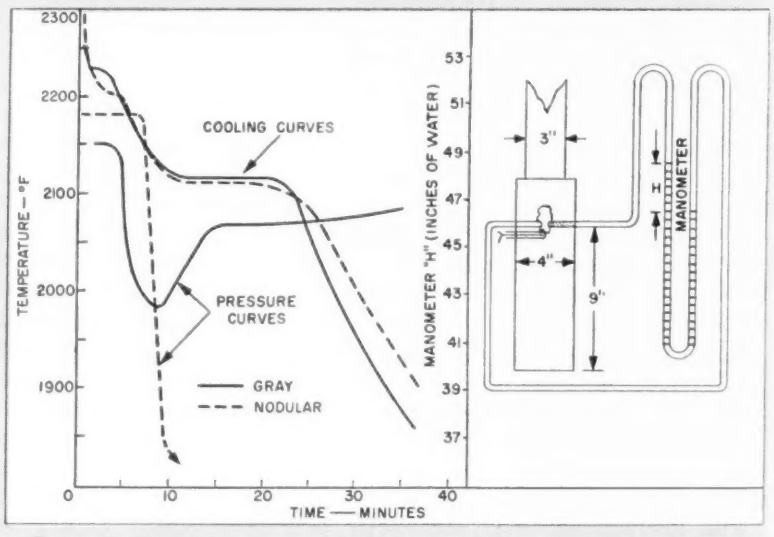


Fig. 17—Illustrating the manometer method used in the case of gray iron to establish the development of shrinkage void and the subsequent refilling

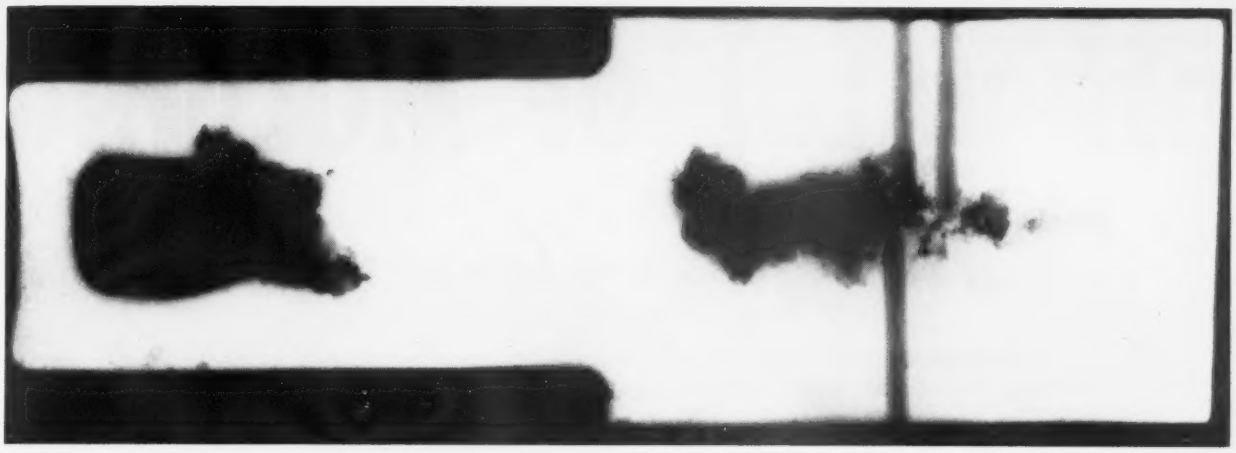


Fig. 18—Radiograph of nodular iron casting at shrinkage positions. Note manometer tubes in position; right tube contains thermocouple

and graphite, causing the growth of the spherulites. With such a process the expansion forces of graphite formation cannot be relieved by displacing liquid since the interdendritic channels in the direction of the center at this time are highly choked with carbide material. In other words, the expansion of flake graphite formation occurs in a liquid medium and that of nodular iron in a solid medium, as illustrated by the expansion arrows of Fig. 9. These differences have a profound effect on the feeding characteristics of the two irons, as will be discussed in the following section.

Feeding Characteristics—Studies of the dilation of casting walls, shrinkage formation and purging as a function of risering have provided basic information relating to the characteristics of feed metal flow in gray and nodular iron castings[6,7]. The dilation studies were conducted by the use of a solidification dilatometer developed for the purpose. Principal features of the solidification dilatometer are illustrated in Fig. 10.

A 4 x 4 x 12-in. casting is molded in a steel flask. The end of a sand-filled quartz tube is positioned at the mold-metal interface. The opposite end rests against a lever arm which actuates a dial gage. Casting wall movements thus are followed during the period of solidification. The progress of wall growth is determined by a series of thermocouples positioned from surface to center at the tube position. Other couples are located along the vertical centerline of the casting and riser to determine the timing of the completion of wall growth at various center positions in the vertical direction.

The specific aim of the investigations was to correlate the movements of the casting wall with the movement of the various freezing waves across the casting section (wall growth) and the freezing time of the risers. The period of movement of the eutectic start and end of freeze waves was of particular interest since expansions due to graphite formation should occur during this time. The effects of risers which solidified prior to and following the solidification of the casting were determined by applying risers of 3, 4, 5 and 6-in. diameters (all 6 in. high).

The dilation characteristics of the gray iron casting (3.0 per cent C, 1.5 per cent Si, 0.40 per cent Mn) for the case of risers of early and late solidification times are illustrated in Fig. 11 in relation to the solidification features. The cooling curves represent data obtained from the thermocouples located along the vertical centerline. The time of riser solidification as compared to casting solidification may be deduced from these curves. The cooling curve data obtained from the thermocouples located at various cross section positions at the tube level were used to plot the solidification diagrams at the bottom of the figure. The D curves represent the movement of the casting wall as measured by the solidification dilatometer.

For the 3 in.-diam riser, the D curve shows a sharp rise at approximately 18 minutes, indicating expansion of the casting. At this time the wall growth solidification curves show that the eutectic reaction has started at the surface, and the cooling curves show that the top of the riser has solidified completely. As the eutectic reaction band moves across the casting, the casting continues to expand. At approximately 38 minutes, the expansion cycle comes to an end, and contraction begins. At this time the solidification curves show that the eutectic reaction is completed and the casting has solidified. No purging was observed at the riser surface.

The casting with a 6-in. diam riser shows a slight rise in the expansion curve during the period of eutectic formation. The cooling curves show that the riser remained open during the entire time of solidification of the casting (riser top solidified at 48 minutes, the casting at 38 minutes). A large purge was observed at the riser surface. The purged metal was of eutectic composition and was exuded from the casting during the period of eutectic reaction (approximately 20 to 35 minutes).

A summary of such observations for the 3, 4, 5 and 6-in. riser systems cast in three types of sands is presented in Fig. 12. The D curves show that casting expansions and the code marks on the curves denote the timing (*Please turn to page* 249)

pH VALUE OF MOLDING

...Its Effect on Casting Quality

Based on original research and operating experience, this paper was presented before the Steel Founders' Society of America's Technical & Operating Conference in Cleveland on Nov. 5, 1953

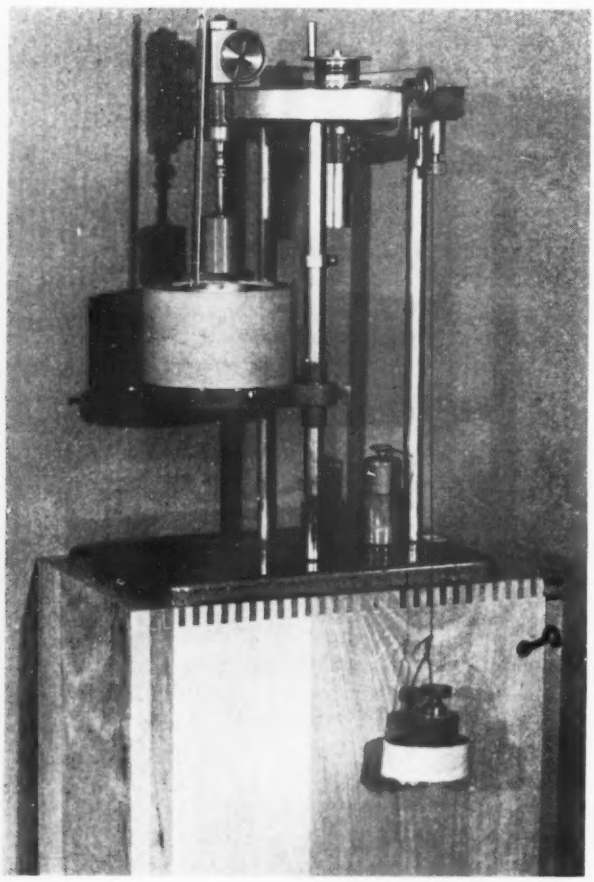


Fig. 1—Stormer instrument measures viscosity, which enables clay to stay suspended in water

OTHER industries using far more clay than the foundry industry long have known that the ions attached to clay particles and the soluble salts found with them greatly influence the behavior of clay. Foundrymen also have known this, as is witnessed by their differentiation between sodium (western) and calcium (southern) bentonite.

However, other industries have gone one step farther by adding chemicals to change the behavior of the clay to gain some desirable feature or to offset any change in clay due to processing conditions. Foundrymen have not been totally ignorant of this possibility; they have, however, been unaware of its significance.

For example, the *Foundry Sand Handbook* specifies the use of sodium hydroxide in the AFS clay test to keep clay from agglomerating when cereal is present. Booth[1] measured room temperature properties of natural molding sands and found that significant changes occurred as sodium carbonate was added. Taylor[2] stated that the pH value could be used to control sand properties, but gave no reference to the properties desired or the method to be used.

The foundryman realizes the need for some additional control to produce better castings—castings with improved surface finish and relative freedom from scrap that do not require extra work because

Fig. 2—Chart shows how the viscosity and yield strength of a 10 per cent western bentonite slurry are changed by adding sodium carbonate

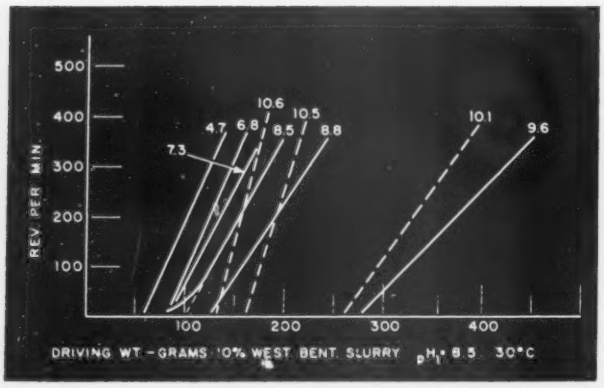
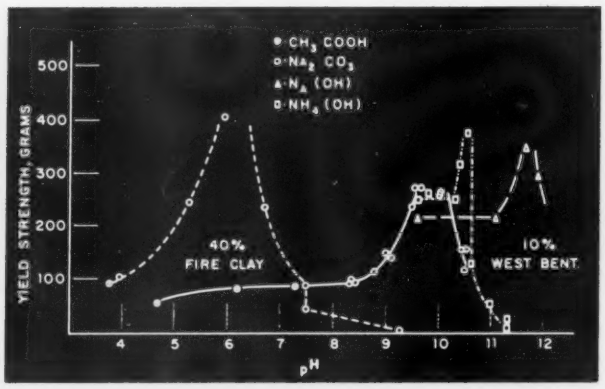


Fig. 3—In this chart, yield strength is plotted against pH value for the following chemicals: Acetic acid, sodium carbonate, sodium silicate, sodium hydroxide and ammonium hydroxide



SANDS

By VICTOR E. ZANG
Vice President
Unitcast Corp.
Toledo, O.

and GERALD J. GROTT
Superintendent of Standards
Unitcast Corp.
Toledo, O.

of poor molding sand.

The purpose of this paper is to illustrate that numbers, called pH values, read from an electrical device, called a pH meter, can help foundrymen to produce better castings through better control of the colloid binders in molding sand.

Theory will be limited to the minimum essential to the introduction of a few concepts. Because the discussion of a subject new to many foundrymen creates a problem concerning the order of presentation of theory and practice, the authors hope that the outline below will aid the reader in following the discussion:

1. The meaning and use of the pH value.
2. The effect of chemicals on clays.
3. The effect of sodium carbonate on molding sand as reflected by casting quality.
4. A practical approach to your molding sand.

Meaning and Use of the pH Value—The foundryman makes a choice concerning the chemicals associated with his clay when he decides which clay to use; some soluble salts in this clay give it properties he desires. He then is interested in either improving or at least maintaining these properties throughout the life of the clay. To do this he must be able to determine the kind and amount of chemicals associated with the clay at any stage of its life. For clays or molding sand mixtures, analysis of these chemicals is a tedious process not adapted to routine process control. There is, however, a backdoor approach.

Consider this reasoning: (1) The activity of hydrogen ions in a solution can be measured. (2) The activity of hydrogen ions is greatly affected by the presence of other ions in the solution. (3) The degree of this effect depends upon both the kind and amount of these other ions. (4) Therefore, if we know what ions other than hydrogen ions are present in the clay as purchased, and what ions may be introduced by our use of the clay, we may estimate the amount from their effect on the activity of the hydrogen ions.

This "activity," as used in this paper, means that the solution acts as if there were a given concentration of hydrogen ions present.

In a strict definition it is the concentration multiplied by the average effectiveness (called the activity coefficient). Accordingly,

$$a_h+ = C_h+ \times f_h+$$

In this formula, a_h+ equals activity, C_h+ equals concentration and f_h+ equals activity coefficient.

How do we measure this hydrogen ion activity? We know that hydrogen ions carry a positive charge and go to the cathode of a wet cell battery. Let us construct such a wet cell battery with one of the electrodes shielded by a glass membrane that allows only the transfer of hydrogen ions. Then hydrogen ions will be the only positive ions (cations) that participate in creating a voltage across the cell. If we know the characteristics of the

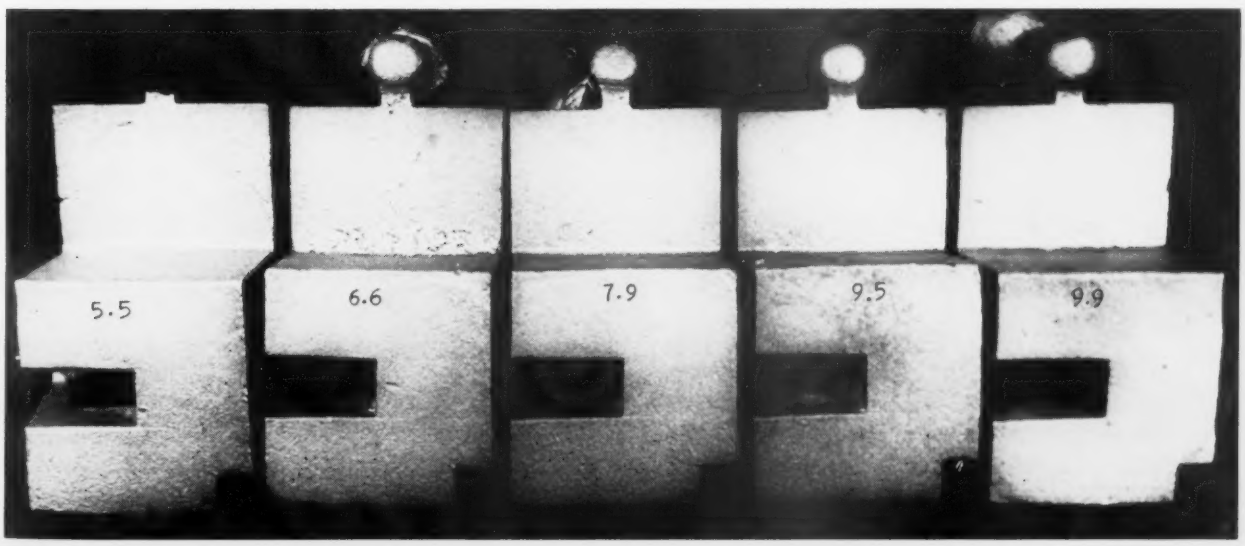
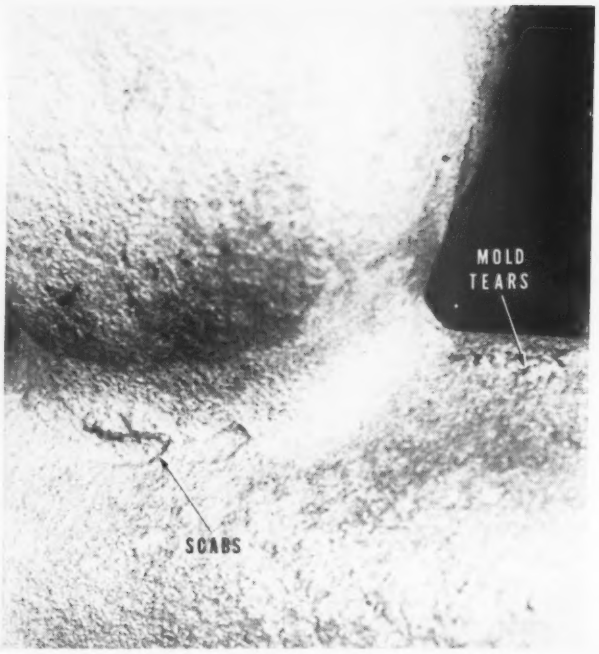


Fig. 4—Sand at a pH under 6.0 was brittle in molding, eroded badly and caused numerous drag scabs. Additions of soda ash ended problems, and a temporary standard of 7.8 to 8.3 was set



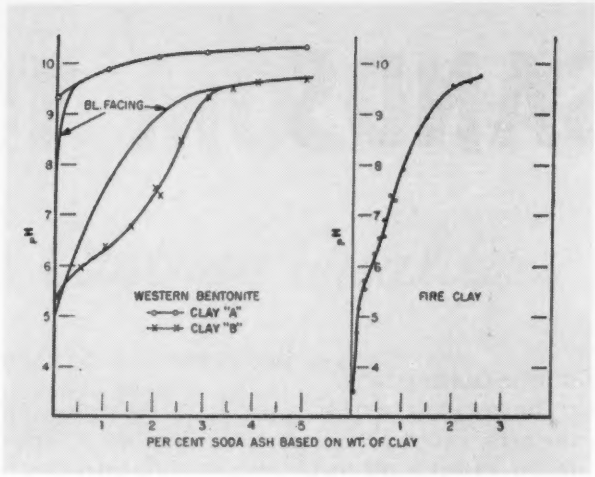


Fig. 5—An approximation of the amount of soda ash to add may be made by constructing a pH vs per cent of soda ash curve, like the one above

Fig. 6—Illustration on left shows casting defects caused by use of sand with pH under 6.0

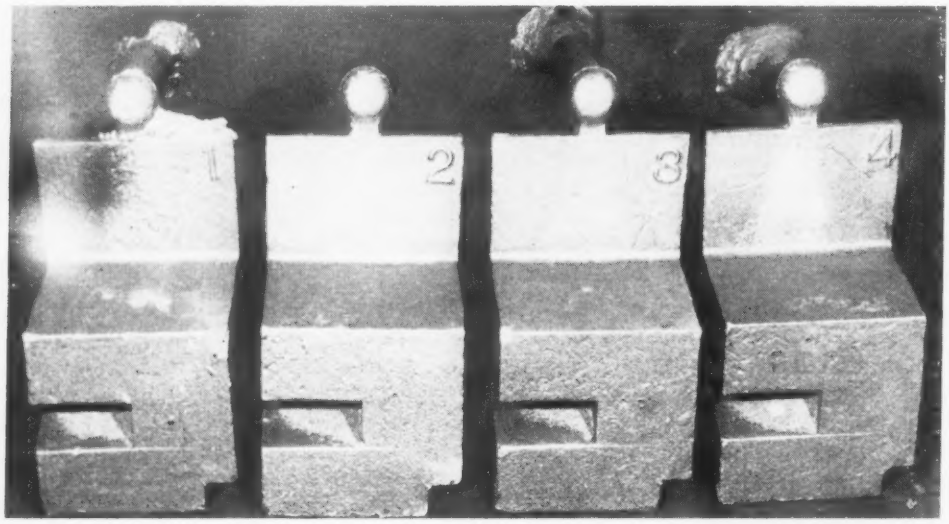
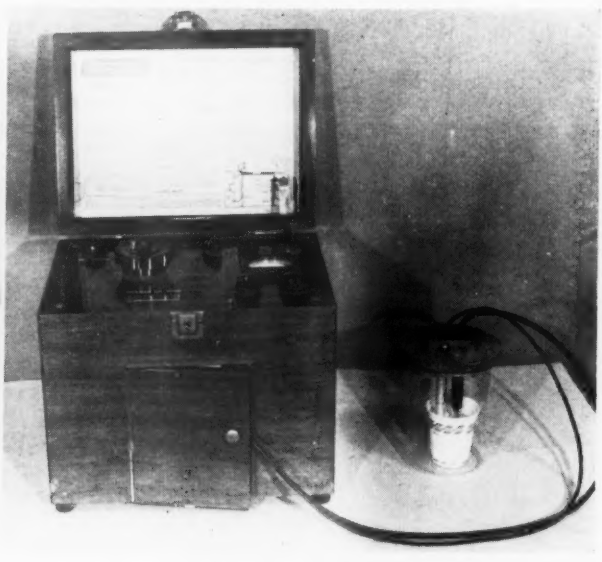


Fig. 7—This series of castings was made in a 3 per cent bentonite, 0.75 per cent cereal mix. No addition was made to the first mix, the soda ash was added to the next two, and a commercial sand conditioner was added to the last of the mixes



Figs. 8 and 9—Two models of pH meters used by the authors are among means available for measuring pH values. Industrial model on left is easy to operate and accurate beyond sand control needs. Glass sleeve type electrode (right) gives rapid response and can be cleaned easily

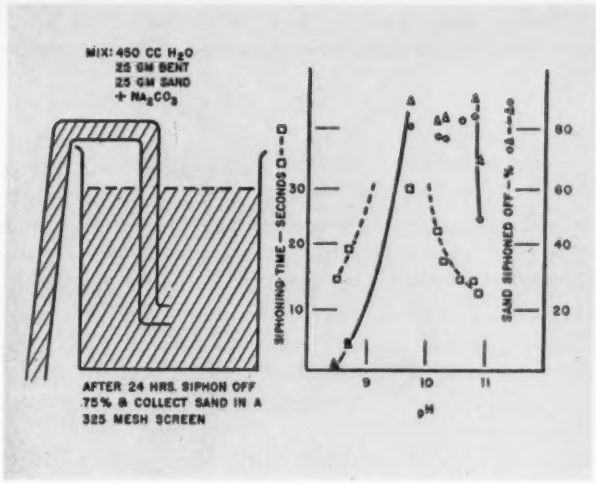


Fig. 10—Details of physical test used in study

electrodes we may then use this voltage to define the average activity of all the hydrogen ions in the cell fluid (the electrolyte).

The pH meter is constructed so that we may lower electrodes furnished with the instrument into a clay-water or molding sand-water mixture, and, by using this mixture as the electrolyte, determine the average activity of all the hydrogen ions associated with the clay merely by operating the dials.

The meaning of pH is: $pH = -\log a_{h+} = -\log (C_{h+} \times f_{h+})$.

Because a logarithm is in the defining equation, a change in the pH value of one unit, say, from seven for pure water to six for a weak acid means a tenfold increase in the hydrogen ion activity of the solution.

The use of pH lies in the correlation of its measurement with the kind and amount of other ions in the electrolyte. This may be done in the laboratory or in the foundry.

Chemicals and Clays—How do chemicals affect clay? There will be no detailed discussion of theory. Let it be sufficient to say that hydrogen ions attach themselves to clay particles and that they may be replaced by other ions. The number and kind of ions attached to each clay particle determine to a large extent the way in which a given clay behaves.

One property of clay is its ability to stay in suspension in water and to form a more or less viscous slurry. Fig. 1 shows the Stormer instrument for measuring viscosities. The slurry is placed in the cup, and a cylinder is made to revolve in the slurry by the force of a falling weight. Larger weights cause the cup to rotate faster.

A plot of the revolutions per minute versus the driving weight gives a curve that is a straight line for all but the lowest rpm. The slope of the straight line portion of the curve indicates the viscosity: The lower the slope, the thicker the slurry. The viscosity is a measure of the size and concentration of clay particles or groups of particles.

By an extension of the straight line portion of the curve to the horizontal axis, the yield strength of the slurry is obtained. The yield strength is a measure of the forces acting between the clay particles or groups of particles.

Fig. 2 shows how the viscosity and yield strength of a 10 per cent western bentonite slurry may be changed by adding sodium carbonate. The pH value for each curve is given, but it was the sodium carbonate that did the work. The pH value is but a measure of the replacement of hydrogen ions by sodium ions. The change in the slope of the curves shows how the clay particles either dispersed, settled out or agglomerated as sodium carbonate was added. The yield strength shows how the gelling power changed.

That it is the chemical that does the job may be illustrated by Fig. 3. Here the yield strength is plotted versus pH for the following chemicals: Acetic acid, sodium carbonate, sodium silicate, sodium hydroxide and ammonium hydroxide. The general shape of the curves is similar in that each basic chemical raises the yield point to a maximum and further additions lower it. However, the pH at which the maximum value, or any other given point, occurs is different for each chemical.

Three of these chemicals break down to give sodium ions, but their effects differ. It is becoming obvious that not only the ions that replace hydrogen ions are important, but that the other part of the chemical, the anion, is also significant.

If the pH value is to serve as a control, we first must find through experience which chemical to use and the pH value at which that chemical gives the best results. Then we may add that chemical to our sand mix to maintain this "best" pH value.

TABLE I—Laboratory Data on Sands

	—Acetic Acid—		——Soda Ash——		
pH	5.5	6.6	7.9	9.5	9.9
Specimen wgt., grams	159	159	159	159	159
Per Cent H_2O	3.4	3.4	3.4	3.4	3.5
Permeability	180	185	180	180	170
Comp. Str., psi:					
Green	12.2	12.1	11.6	11.1	10.4
Dry*	77	73	54	44	38
Shear Str., psi:					
Green	3.3	3.2	3.3	3.2	3.1
Dry*	62	51	46	37	36
Hot Comp. Str., psi:					
600° F	100	105	80	85	88
1000° F	87	80	63	68	80
1400° F	113	138	88	95	110
1800° F	345	400	330	235	435

*Air dry 12 hours

Chemicals, Molding Sands, and Castings—Previous illustrations show that chemicals do have an effect on western bentonite. Let it be stated in advance of the evidence that there also is an effect on molding sands that is reflected by molding ease and casting quality.

Consider the case familiar to at least some foundrymen. A little erosion and a few drag scabs show up along with some mold tears or breaks. This situation may clear up with apparently no change in practice. It also may go from bad to worse, in spite of everything that is added, eliminated or swapped around.

Since the start by (*Please turn to page* 280)

QUESTIONS

Enlarging of the center core equalizes thickness . . . . .
Making white iron . . . . . Warping of castings
Questions holding of iron in the cupola well . . . . . .

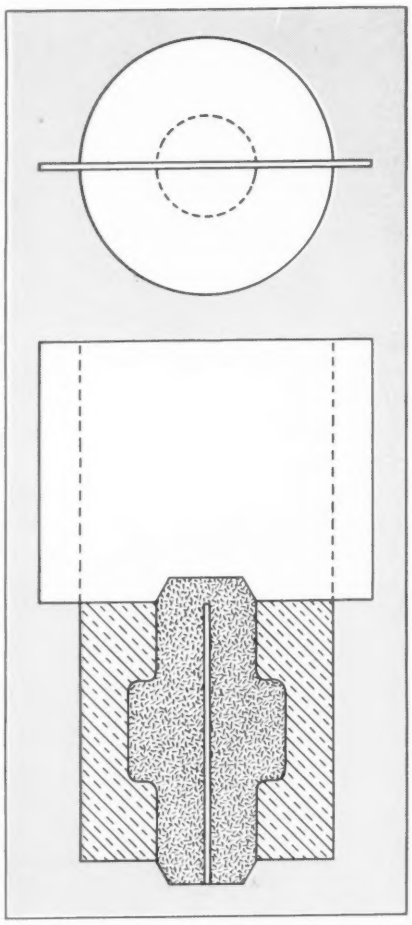
Shrinkage in Propeller Hub

QUESTION Occasionally we find shrink holes in the bore of a 395-lb, 48-in. manganese bronze propeller hub. These shrink holes are opposite the area where the blades join the hub. The feeding riser is a full size extension of the hub and equal in height to the hub. The center core extends to the level of the riser top. Metal enters the hub at the bottom. When the metal reaches the bottom of the riser the crucible is shifted and the remainder of the metal at 1800° F is poured directly down into the riser. Metal in the riser is pumped with a rod and frequent additions made of fresh, hot metal. Would cast iron chills at junction of blade and hub prevent shrinkage in the bore? Would chills adversely affect the casting in any way? Instead of chills, should we use a larger diameter and higher riser?

ANSWER When only one casting out of a considerable number shows a defect, it opens a rather wide field of speculation, assuming that the castings are made under exactly similar conditions. Unfortunately, sometimes the assumption may be in error. Then the investigator may have to stumble down several dim trails while attempting to find a solution. Your present practice, including bottom gate, hub size feeder, metal temperature, addition of hot metal to the feeder, conforms to the technique observed in foundries producing manganese bronze propeller castings.

A possibility exists that the casting with the shrinkage defect was made in a mold that yielded slightly under the high head pressure and the action of the feeding rod. Close examination may be necessary to decide whether the holes are shrink holes or blow holes from faulty metal or imperfect mold or core. Chills have their place in foundry practice, but so far as we know they never have been used for the purpose you have in mind. Certainly they would not do any harm, but they would exert no effect on the metal around the center core.

A rigid mold, properly made, gated and risered as you describe, should produce a satisfactory casting without the use of a pumping rod. The center core should be enlarged in the central area to partly equalize the metal thickness in the hub. The core does not extend through the riser. It is vented through the bottom and is centered and held down by a ¼-in. steel plate resting vertically on the top print and anchored in slots on opposite sides of the riser as indicated in the accompanying sketch. The plate is thoroughly cleaned and then covered on both sides with a coat of thick blacking and dried.



Steel plate centers and anchors hub core and splits riser metal

Another purpose of the core is to split the riser metal into convenient charging size. In the mold it is held in place by a weight or in any other convenient manner. With ordinary care the plate may be used repeatedly. Metal in the riser is not pumped with a rod. The top surface is covered with blacking, charcoal or other insulating material.

White Iron Production Method

QUESTION We would appreciate being advised if any articles have appeared in FOUNDRY in connection with white iron in which we are interested just now.

ANSWER Latest articles published include "Internal Porosity and Inverse Segregation in White Cast Iron," by W. B. Sobers, June, 1953, and "Cold Cracks in White Iron," by E. J. Jory, April, 1954.

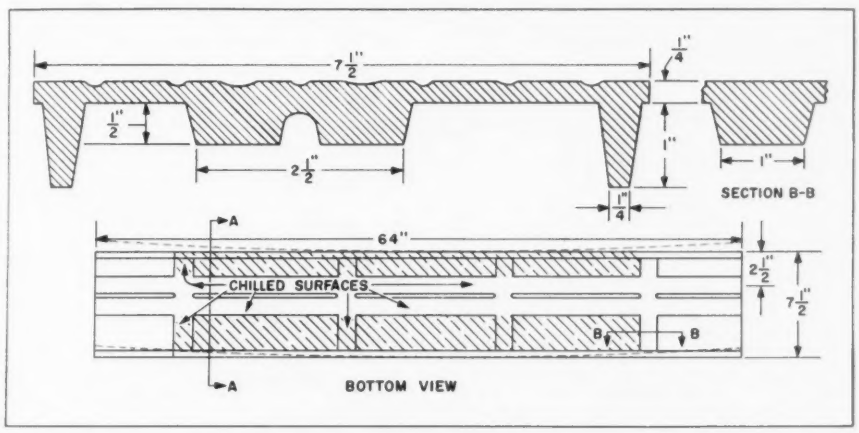
As you undoubtedly know, white iron can be produced in a variety of ways. Commonest method probably is by reduction of the silicon content to a point where its graphitization effect or power is practically nil. Amount of reduction will depend upon section thickness of the casting. For example, an iron with a silicon content of 2 per cent probably would result in a white fracture with a ⅛-in. section, but not necessarily in a 3/16-in. section. With a 2-in. section the silicon may have to be reduced to 0.60 per cent or lower.

Another method is to increase the rate of freezing or solidification by use of chills. This prevents the carbon in solution or combination as cementite from transforming or breaking down into pearlite and graphite. With use of chills of sufficient thickness in relation to casting section thickness, no change may have to be made in silicon content. Also, by use of chills and adjustment of silicon for section size, it is possible to obtain white iron at the interface—backed up with gray fracture iron for the remainder of the section.

Third method is by the use of carbide stabilizing or alloying agents such as chromium or tellurium, which prevent transformation of cementite into other com-

binations of iron and carbon. Tellurium is much more drastic in its action than chromium; use of only a few grams per ton of iron can produce a white structure.

An alloy iron in two grades or types which is reported to give excellent results against abrasive wear contains nickel and chromium, and may be cast in sand or in chills. Essentially the composition of both is 0.40 to 0.70 per cent Si, 0.40 to 0.70 per cent Mn, 0.15 per cent S max, 0.40 per cent P max, 4.00 to 4.75 per cent Ni, and 1.40 to 3.50 per cent Cr. Total carbon may be 3.0 to 3.6 per cent in the regular type or 2.9 per cent max in the high-strength type. Castings must be given a stress relief heat treatment at 400 to 450° F before placing in service.



Dotted line indicates the form the casting assumes when shaken out

Long Aluminum Castings Warp

QUESTION We are enclosing the print of one type of elevator sills we cast in aluminum. They are poured red hot to hold the grit. Some of the sills are 9 and 10 ft long. We have made aluminum patterns from the original wood patterns, but when the castings are removed from the sand we find a bow in them. We gate castings at one end and chill heavy ribs down the middle. Pattern is rapped evenly all the way down. We also have one pattern with three ribs, and it bows the most.

ANSWER Problem of warpage in long castings has been encountered by many foundrymen, and is a difficult one to resolve. Apparent reason for warpage is difference in solidification rates between various parts of the casting. With various portions of a large flat casting solidifying at different times, stresses are set up by the metal, and in order to counteract them the casting warps.

In this particular case it would seem that the problem could be approached by modifying the gating. Present system introduces all the metal into the long casting at one end. This means that the metal must run a long distance to fill the mold. Metal reaching the far end of the mold obviously has lost considerable heat by the time the mold has filled out and solidification must start at that end rather rapidly. At the same time, since all the metal is introduced through gates at the other end, there is a tendency to overheat the sand locally at the ingate end. This sets up a condition of unequal cooling, resulting in stresses which in turn cause warpage.

Perhaps the most reasonable approach would be to revise the gating so that metal enters the mold over the greatest possible number of places. To this end multiple ingates along the side of the casting are recommended. This would have the general effect of filling the mold more quickly and especially filling the two ends of the casting at approximately the same rate. Since whatever differences in cooling rate that would exist would now be over a 7½-in. width instead of 64 in., the chances of warpage would thereby be reduced.

Using a single sprue in the center or middle of the long side would mean running the metal 32 in. in both directions. Under normal conditions with the range of pouring temperatures used in aluminum castings, this might not be adequate. However, since it is necessary to pour these castings at high temperature, the single sprue undoubtedly would serve satisfactorily.

Holding Iron in Cupola Well

QUESTION We melt our iron in a No. 6 cupola lined to 47 in. above the tuyeres, and 42 to 44 in. below, and use 1000-lb charges. Well is deep enough to hold four charges and we tap into a 2-ton ladle when four charges are melted. Iron is good and hot. After blast is on it takes one-half hour to get the first four charges, and then four are melted every 10 minutes. Is it good practice to hold four charges before tapping? Our only reason is that the taphole is low and the slaghole even with the tuyeres. We melt 12 tons.

ANSWER As long as your iron is hot enough to pour your castings satisfactorily, holding it in the cupola well will have little if any effect on it. Usual objection to holding the metal in the well is that unless it is good and hot, there is a tendency toward temperature decrease. The same tendency occurs in holding metal in the ladle. Presumably your operating conditions are such that the particular combination functions satisfactorily.

According to the figures given, you are melting at the rate of 9 tons an hour which leaves little room for complaint. Possibly you could cut off about 10 minutes on the first tap by reducing the coke bed. Usually a good melting rate is attained in 8 to 10 minutes after the blast is turned on. You melt at the rate of four charges in 10 minutes but take 30 minutes for the first four; this would indicate that 10 minutes is spent in burning excess coke on the bed to bring it down to the operating level.

Insert Must Be Clean and Dry

QUESTION Our foundry is considering an automotive production item which involves a gray iron casting with a steel insert, and we would like to have information on any published literature and technical papers on the subject.

ANSWER We do not recall any published literature on the subject of casting-in steel inserts in gray iron castings, although from time to time it is mentioned. Essential point in eliminating trouble from blows when molten metal comes in contact with the inserts is to see that the latter are dry, clean, and preferably slightly above the temperature of the molding sand to prevent the possibility of moisture condensation.

By clean we mean that the insert must be free from oil, grease, rust, scale, etc. Usually an abrasive blasting operation will do a good job in that respect. After cleaning the inserts should be kept in a warm dry place to prevent re-rusting until they are used. Also, the inserts should be placed in the mold cavity just prior to closing and pouring off to further reduce the possibility of moisture condensation.

Surface of Plate Is Not Flat

QUESTION We are forwarding a floor plate 10 x 10 in. which is low in the center when measured with a straight edge across the diagonals. Customer objects to that since the plates are used on dairy and ice cream manufacturing floors and tend to hold liquids, causing unsanitary conditions. These are made face up, singly, from matchplates in 14 x 16-in. tapered snap flask. Steel jackets are used in pouring with a fairly heavy weight to keep the casting weight within limits. Shifter seems to use reasonable care in moving the weights. Drag is 4 in. and cope is 5 in. One way would be to pour the plates face down, but that slows up production and raises molding costs which the customer will not pay.

ANSWER Examination of the cast iron floor plate shows that it lacks flatness as you indicate, and measurement of metal thickness (bottom of corrugations) on the outside edges and center indicates that the center is about 3/16-in. as against ¼-in. for the outside.

You do not mention the size of the weight being used, but we believe that if it is large enough to extend slightly beyond the plate area—even in one direction—and is reasonably flat on the underside, it will not push the mold center down and cause the trouble. If the weight rests essentially on the center portion, it could deform the mold.

A possible cause of your trouble is that the pattern is thinner in the center than at the edges; it would be advisable to check this.

Liners Show Splotchy Areas

QUESTION We are producing cylinder liners 18¼ in. OD, ⅞-in. wall, and 44 to 48 in. long in dry sand, poured vertically through pop gates under a pouring basin. Charges are 1000 lb containing 300 lb steel (structural and plate), 240 lb pig iron (1.75 to 2.25 Si), 460 lb machinery and auto scrap (1.80 to 2.00 Si), and two manganese briquets (2 lb Mn and ½-lb Si). Thirty pounds of limestone is used between splits. From that we calculate a Si content of 1.40 to 1.50 per cent, and add 1 per cent of Ni-Cr alloy (5 Ni-1 Cr) at the spout. We consider our pouring temperature satisfactory and hold the iron in the pouring ladle for about 2 minutes after receiving from the mixing ladle, before pouring. Our problem is that after a ¼-in. cut is taken inside and out, leaving a ⅜-in. wall, segregated splotches appear inside and out in quite a number which is more pronounced in the size mentioned than in smaller liners. We are at a loss to understand why the splotches appear.

ANSWER While you did not mention where the splotches appear, we suspect they mainly are located in the upper portion of the liners, and are due, we believe, to the difference in cooling rate between the lower and upper sections. First metal poured in loses considerable heat in its descent and solidifies faster than that coming in later which falls only a few inches and consequently loses only a little heat.

Where slow cooling occurs there is a tendency to greater precipitation of graphite and coarser grain structure. Temperature of the metal also enters into this since the greater the amount of superheat, the slower the cooling rate.

Since your trouble with the splotchy appearance seems to be sporadic, you might be able to overcome the difficulty by closer attention to pouring temperature. Naturally you will have to do some surveys; pouring at different temperatures, first to ascertain whether or not it has an effect, and if so to establish the limits of the temperature range wherein suitable results are obtained.

Another possibility is control of the pouring rate by adjustment of the size and number of the pop or pencil gates. This again requires some experimental work to determine the most suitable combination. By proper control of metal temperature and the total area of the pop gates it is possible to approach the condition where the metal solidifies as soon as it is in place, resulting in uniform cooling from bottom to top.

Alternative method would be to place "denseners" that is, chills with a thin layer of sand between them and the mold face—in the top section of the mold or core to hasten the rate of solidification.

Interested in the Appearance

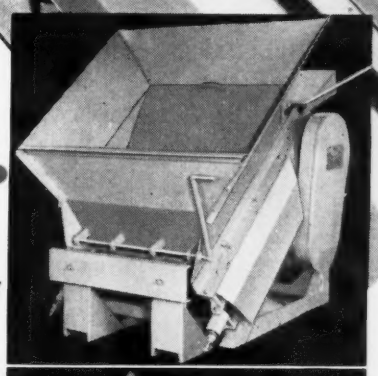
QUESTION Under separate cover we are sending you sample brass fittings made in our foundry and by one of our competitors. You will note that there is considerable difference in the external finish—ours being the poorer. We have tried various types of molding sand such as Albany, Illinois and Tennessee as well as spraying the molds with molasses water, and have tried using flour. Can you offer any suggestions which would improve the finish on our castings?

ANSWER After examining the castings and reading your inquiry we are not quite sure what information you desire. To us the external finish means the degree of surface smoothness, and that would be related to your mention of sands, etc. Such a decision of course, is a matter of personal opinion when it rests simply upon visual observation and feel with the finger tip. In our opinion there is little difference between the two specimens, and the slight difference would favor your casting.

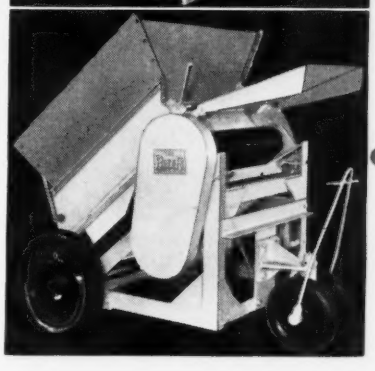
It might be pointed out that our choice is based on the fact that the other casting shows small but distinct projecting points or pimples all over the surface while yours does not. We have tried

(Concluded on page 124)

Semi-mechanize Your Sand Handling



STATIONARY MODEL NYS-E



PORTABLE MODEL NYP-E

With the "NY" Series of Royer Sand Separators and Blenders, small and medium sized foundries can semi-mechanize their sand handling by means of front-end loaders. In the present day system of centralized sand control, all sand is carried to and from a central control station by means of such loaders. This method of operation brings about the problem of fluffing and aerating the conditioned sand which has been packed in the mulling and transporting operation. The time and place to perform this necessary operation is at the molding station as the sand is being returned for the molding operation. This can be done with a portable "NYP-E" unit, easily moved to the stations during the sand conditioning operation. Sand is completely mixed, blended, aerated, cooled . . . and discharged light and fluffy, ready for the molder's use. The extension hopper, deflector door and adjustable control gate allows this machine to handle the instantaneous discharge from a 12 cu. ft. bucket without spillage. Portability is provided by crane suspension from hooks welded to the frame; by fork lift; or on a sturdy four-wheeled chassis. Write for bulletin giving details on the "NY" Series.

Export Department, 306 W. Washington Blvd.
Chicago 6, Ill., U.S.A. Cable: ASMAN

Foremost in Sand ROYER *Conditioning Equipment*

ROYER FOUNDRY & MACHINE CO. 159 PRINGLE ST. KINGSTON, PA.

(*Concluded from page 122*)
examining the two surfaces under a magnifying glass without much success, but that seems to indicate that the sand used for your castings might be slightly coarser although that is not conclusive.

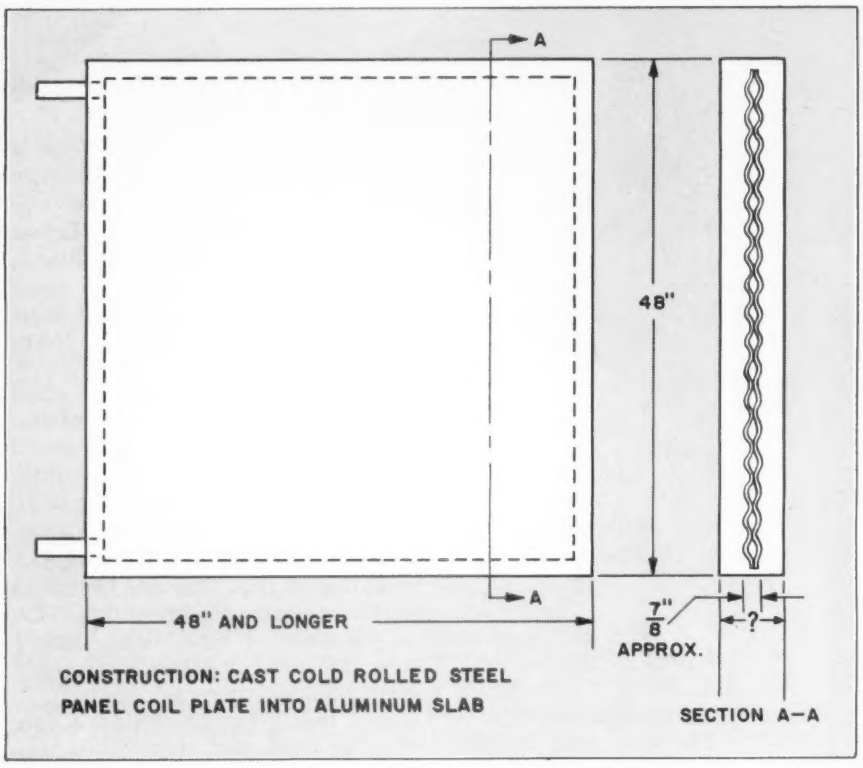
Unfortunately, while you mentioned various sands you have tried, you did not include any information on fineness and grain distribution. Those are important if you are interested in obtaining the smoothest possible surface. Generally the finer the sand the smoother the surface, but as fineness increases, permeability decreases. Hence, the foundryman has to compromise by choosing the finest grain size which can be used without running into trouble from blows.

It is extremely difficult to make a specification relating to sand due to numerous variations, but we believe if you can get one which shows an AFS grain fineness number of about 160 which has 35 to 40 per cent retained on the 140 to 270-mesh screens and 22 to 30 per cent retained on the pan, and 8 to 10 per cent retained on the 70 and 100-mesh screens, you should get a smooth surface. While we do not have any exact data we believe that No. 1 Albany would fall in that range. If that was the grade you tried, then get the next finer one or No. 0.

If it is not surface smoothness you are interested in, but color, it will be necessary to check into the composition, although the lighter and brighter color of the competitor's casting might be obtained through a blasting operation using nonferrous or so-called "copper" shot.

Casting-in Panel Is Problem

QUESTION Enclosed is a sketch of an aluminum slab which is to be used for a heat transfer medium. Interior portion is made of rolled steel, corrugated as indicated, and both leak and pressure proof. Cross section is ⅞-in. We would like your opinion as to the feasibility of casting a piece of this nature. If you feel that it is practical to cast it in sand, we would appreciate your suggestions as to the method of gating, holding the panel, machining allowance, and minimum metal thickness over the coil; considering that the customer would like the casting as thin as possible.



Enclosing large steel panel coil in aluminum involves many problems

ANSWER In view of the not inconsiderable difficulty many foundries have had in casting-in heating elements in aluminum, the advisability of undertaking this job is certainly under question, since a heating element involves much less steel to enclose. It is fairly easy to anticipate the problems involved in trying to cast an aluminum slab around a steel panel coil.

Principal problem obviously is that the chilling action of the panel coil may make it extremely difficult to fill the mold without getting misruns and cold shuts. In addition, there is a considerable problem in supporting the panel coil during the casting operation. The buoyant effect of the aluminum will shift the panel.

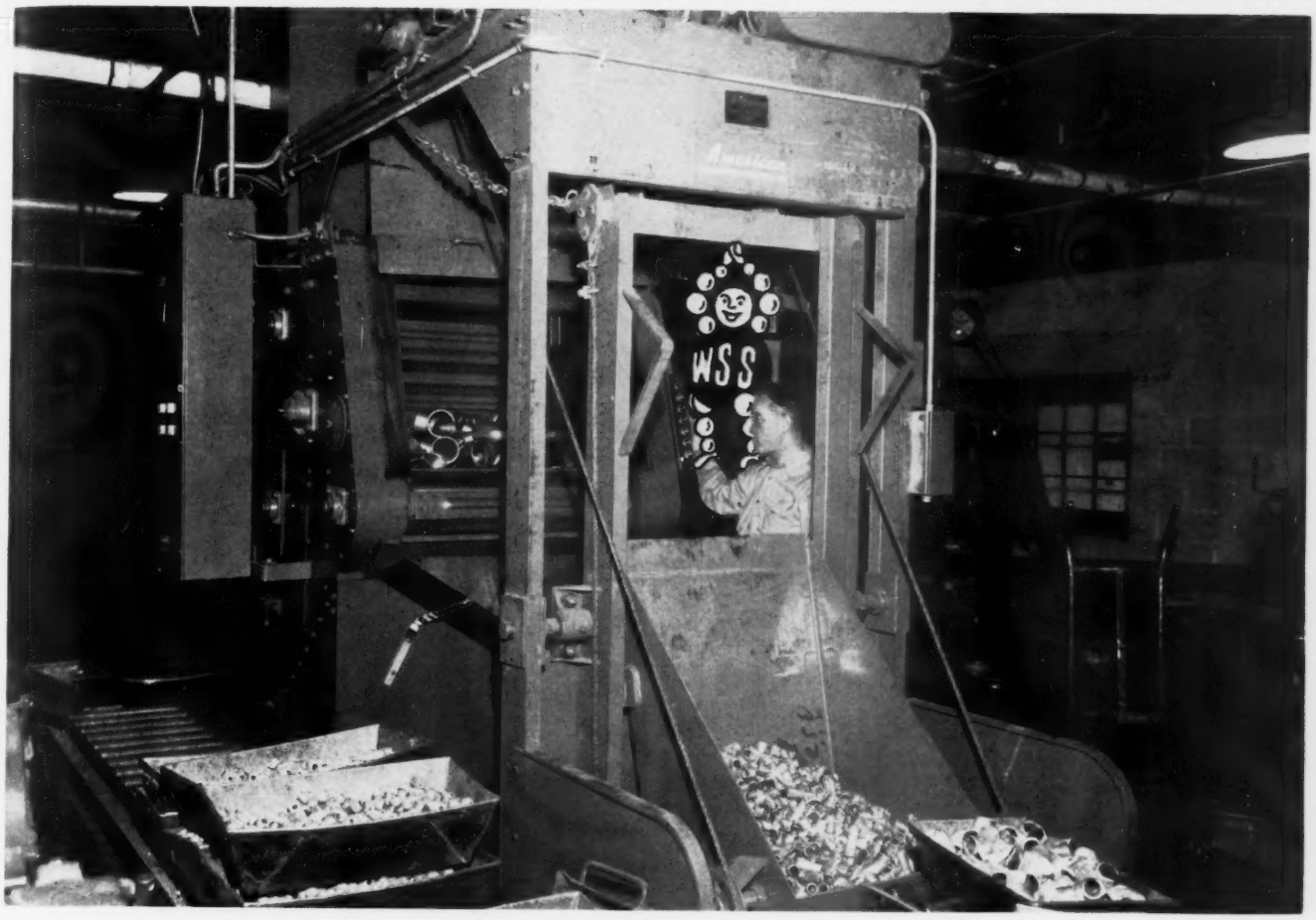
As far as supporting the panel coil within the molds is concerned, two points of support are the outlet and inlet connections, and it is obvious that two studs welded on the opposite side would provide a four-point support. If that is not permissible, then some other means such as sand cores with a later plugging operation, or metal chaplets with drilling out and plugging, would have to be tried.

Amount of aluminum required as a suitable wall thickness is difficult to establish because the chilling effect of the steel panel is an unknown quantity. It might take as much as ½-in. wall in order to guarantee completely filling the mold. It should be pointed out that as a heat transfer medium, aluminum is excellent so that additional aluminum on the panel may not be a serious problem.

If the casting is to made at all, it will require an ingating system which will assure quick filling of the mold. This would demand ingates around the perimeter of the casting with two downsprues. The higher the temperature of the panel coil the better the chance of pouring the metal over it completely. It will be necessary that the steel be clean and dry to prevent blows. That in turn would require some sort of heating operation of the coil prior to placing it in the mold, and then it would be necessary to pour quickly.

Perhaps exercise of initiative and ingenuity on an experimental basis can overcome the difficulties indicated, and bring this job into the foundry field. Progress in the industry is based partly on the ability of foundrymen to go out and take work away from other types of fabrication.

pioneering developments keep WHEELABRATOR® STEEL SHOT first in abrasives



Wheelabrator® Steel Shot Wins on Every Count

Provides Lowest Overall Costs For Every Foundry Cleaning Operation

Wheelabrator Steel Shot cuts cleaning costs 56% over malleable iron shot at Swayne, Robinson & Co.

Slashes maintenance costs 70% over annealed iron shot at Gunite Foundries Corp.

Cuts abrasive costs 30% over malleable iron and another cast steel shot at Woodruff & Edwards, Inc.

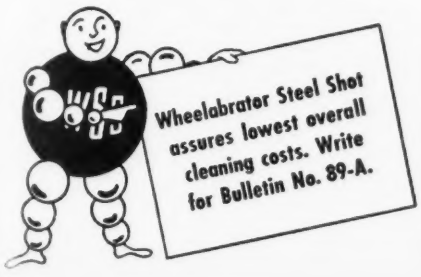
Slashes abrasive costs 50-60% over malleable iron shot at Unicast Corp.

Competitive abrasive tests made by these users and hundreds of others all ended in just one way! "On every count Wheelabrator Steel Shot is the best abrasive buy." These users have switched to this superior electric furnace steel shot, and are continuing its use, because of the many savings it is effecting in their operations —in abrasive consumption, increased production and decreased maintenance.

Combining hardness with toughness, Wheelabrator Steel Shot will clean or peen faster, at lower costs, than any other abrasive. Try it and prove it for yourself.

PLUS

50 lb. cartons and palletizing. A Scheduled Delivery Plan.

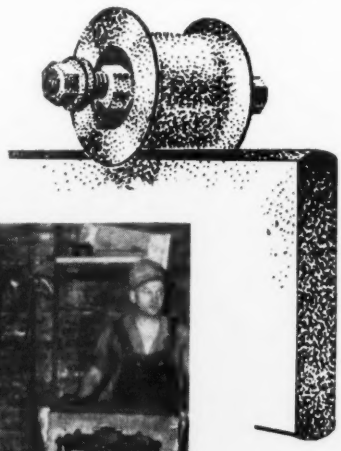


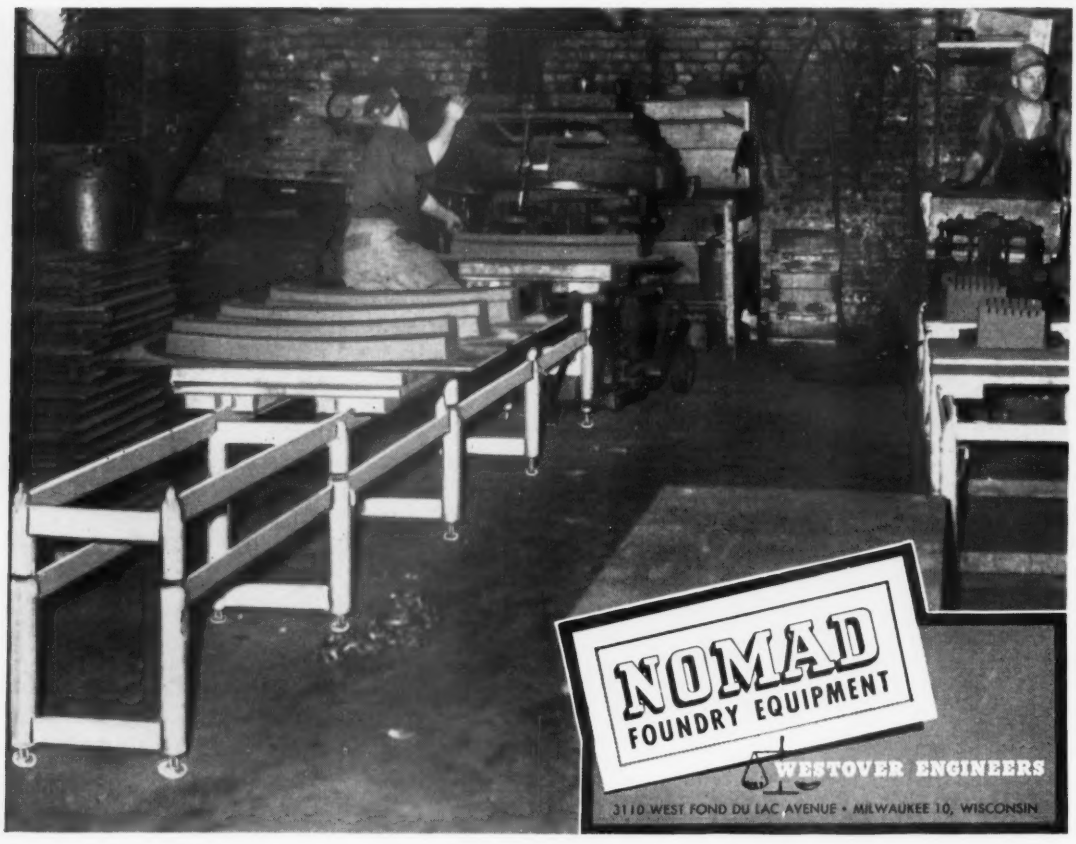
American
WHEELABRATOR & EQUIPMENT CORP.
505 S. Byrkit St., Mishawaka, Indiana

WHEELABRATOR STEEL SHOT

A foundry conveyor system so SIMPLE so EFFECTIVE and so INEXPENSIVE no foundry can afford to be without one.

Every foundry operator knows that mechanization is the only way to beat production costs, but too many of them are afraid of the expense involved. Well, here's a conveyor which any foundry, large or small can afford to buy without shaking their financial resources. We designed this conveyor on the simple principle of putting "roller skates" on aluminum bottom boards, and then sending the bottom boards gliding over specially designed tracks. The tracks, frames, rollers and boards are all simple, sturdy, effective and inexpensive. The system is easy to install, has a low initial cost, and offers no maintenance problems. NOMAD foundry engineers will help you all the way, from most effective layout to final installation. Write today for estimates and case histories.





WESTOVER ENGINEERS
NOMAD FOUNDRY EQUIPMENT DIVISION
3110 W. FOND DU LAC AVE. • MILWAUKEE 10, WISCONSIN

CHARLES F. WALTON
. . . GIFS technical director

JOHN F. DEERY
. . . heads Brinton Foundry

GEORGE E. MILLER
. . . joins Federal Foundry

FRANK A. BENOIT JR.
. . . Brown & Sharpe supt.

CHARLES F. WALTON has been appointed technical director of the Gray Iron Founders' Society. Mr. Walton was graduated from University of Minnesota in 1939 and joined Meehanite Metal Corp., New Rochelle, N. Y., where he became foundry service engineer. Until recently he was professor of metallurgy, Case Institute of Technology and since 1948 also served as a consultant to a number of foundries. In 1952, on leave of absence from Case Institute, he served as technical adviser on foundry production for the Republic of France.

♦ ♦ ♦

John F. Deery, for 15 years general manager, has been named president, Brinton Foundry Inc., Philadelphia, subsidiary of H. Brinton Co., there. In 1920 Mr. Deery joined Hinkle Foundry which was acquired by the Brinton company in 1925. It will now be under separate management.

♦ ♦ ♦

George E. Miller has been appointed sales manager of the Machinery Division of the Federal Foundry Supply Co., Cleveland. Previously he had been sales manager of the Osborn Mfg. Co.'s Machine Division, Cleveland. Graduated from Case Institute of Technology in 1935, Mr. Miller was associated with the Smith Power Transmission Co., Cleveland, from 1936 until 1945. In the latter year he joined Osborn Mfg. Co. as assistant sales manager and a year ago was named sales manager.

♦ ♦ ♦

Frank A. Benoit Jr., for the past year assistant foundry superintendent, Brown & Sharpe Mfg. Co., Providence, R. I., has been appointed foundry and pattern shop superintendent, succeeding **LeRoy M. Sherwin,** retired. Mr. Benoit served his apprenticeship with Brown & Sharpe as a wood-pattern maker, and after a few years with other companies returned in 1934, becoming pattern shop foreman in 1939. Mr. Sherwin, author of technical papers on foundry practice, is a former president of New England Foundrymen's Association.

♦ ♦ ♦

William A. Illsley has been named district sales engineer, Detroit office, American Wheelabrator & Equipment Corp., Mishawaka, Ind. **W. J. Sutherland,** formerly service engineer in the company's Springfield, Mass., office, has been named district sales engineer there. **John H. Burlingame** has filled Mr. Sutherland's former position. **C. J. Osborn** has been promoted to district sales engineer in the Cleveland office, having formerly been a district service engineer there. **Dean T. Pournaras** has assumed Mr. Osborn's former duties. **John J. Savignac** has been appointed a district service engineer in the firm's Milwaukee office. At the Mishawaka, Ind., office, **Robert E. Gallatin** has been appointed district sales engineer. **Harold Groh** has been named district service engineer succeeding **Bruce Berger,** promoted to the home office engineering department.

♦ ♦ ♦

C. S. Burdett recently joined the Philadelphia sales department of Barnett Foundry & Machine Co., Irvington, N. J.

♦ ♦ ♦

George S. Mikhalapov has been elected president, Coast Metals Inc., Little Ferry, N. J., succeeding **John P. Rutherfurd.** Mr. Mikhalapov was graduated from Massachusetts Institute of Technology and previously directed engineering development of equipment and processes at the Knolls Atomic Power Laboratory of General Electric Co. He holds numerous patents for development of electrical equipment, welding and metalworking processes.

♦ ♦ ♦

G. P. Messenger has been named superintendent, iron and steel foundries, National Roll & Foundry Co., Avonmore, Pa. Mr. Messenger has been working recently on projects to improve tank armor, and was a consultant to the Ordnance Corps while associated with the Detroit Arsenal. He previously had worked for Detroit Steel Castings Co. and Pettibone-Mulliken Corp.

♦ ♦ ♦

Eric C. Wussow, since 1942 foundry manager, Kaukauna Machine Corp., Kaukauna, Wis., has been appointed vice president-foundry manager. Mr. Wussow was previously with J. I. Case Co., Rock Island, Ill., and Williams White & Co., Moline, Ill.

♦ ♦ ♦

Sydney W. Simmons, former plant superintendent, Columbus Malleable Iron Co., Columbus, O., and Lake City Malleable Co., Cleveland, has joined the Eastern Malleable Iron Co., Wilmington, Del., in charge of product improvement.

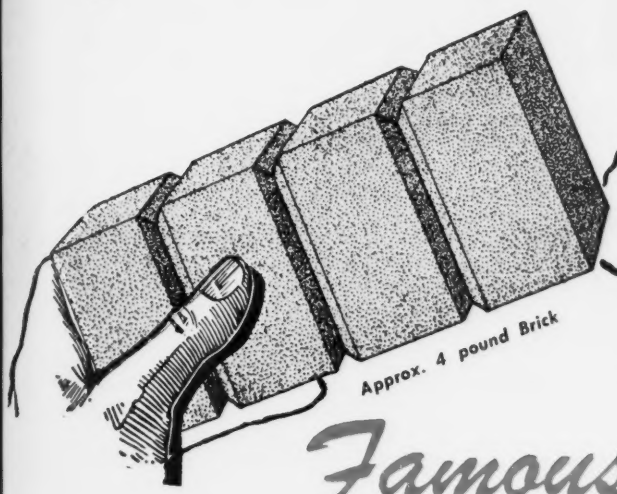
♦ ♦ ♦

Frank J. O'Brien Jr. has been named general sales manager of Metal & Thermit Corp., New York. Mr. O'Brien, former manager, Heekin Can Co., Springdale, Ark., came

(*Continued on page* 130)

QUALITY of CASTINGS
Famous
CORNELL CUPOLA FLUX
cleanses molten iron
IMPROPERLY CLEANSED IRON accounts for big percentage of casting scrap.
CLEAN IRON, minimum scrap loss, during the use of Famous Cornell Cupola Flux.

DEPENDS *on* CONDITION *of* MOLTEN IRON



IT PAYS TO BE SURE THAT ONLY THE CLEANEST IRON REACHES THE MOLDS. THAT'S WHY LEADING GRAY IRON FOUNDRIES AND MALLEABLE FOUNDRIES WITH CUPOLAS ARE REGULAR USERS OF—

Famous CORNELL CUPOLA FLUX

IN PRE-MEASURED SCORED BRICK FORM

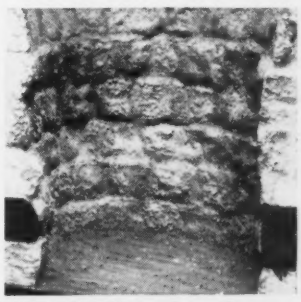
In every cupola charge that is not thoroughly cleansed, there are impurities which are detrimental to the production of the best castings. That is why you need the most dependable cleansing medium—Famous Cornell Cupola Flux. It not only does the job right but makes iron hotter, more fluid and reduces sulphur (in many cases) to practically nothing. And due to the absence of hard spots, hollow centers, etc., machining is easier and smoother.

Famous Cornell Cupola Flux, while cleansing molten iron, keeps cupolas cleaner—digging out time and labor is practically nil, and it forms a glazed or vitrified protective surface on brick or stone, reducing erosion and patching.

Famous Cornell Cupola Flux in *Pre-Measured Scored Brick Form*, takes but a few seconds labor to use and you avoid waste. You simply toss this flux into cupola with each ton charge of iron, or break off one to three briquettes (quarter sections) to obtain the correct amount for smaller or fractional charges. Complete instructions with orders.

WRITE FOR BULLETIN NO. 46-B

THE CUPOLA before using Famous Cornell Cupola Flux.



THE CUPOLA where Famous Cornell Cupola Flux is used.

The Cleveland Flux Co.

6-1040 MAIN AVENUE, N. W., CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes – Since 1918

FAMOUS CORNELL FLUXES

Trade Mark Registered

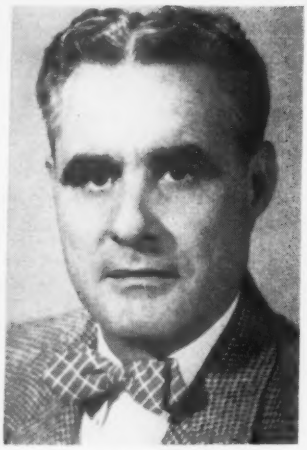
BRASS FLUX

FAMOUS CORNELL BRASS FLUX cleanses molten brass even when the dirtiest brass turnings or sweepings are used. You pour clean, strong castings which withstand high pressure tests and take a beautiful finish. The use of this flux saves considerable tin and other metals, and keeps crucible and furnace linings cleaner, adds to lining life and reduces maintenance.

ALUMINUM FLUX

FAMOUS CORNELL ALUMINUM FLUX cleanses molten aluminum so that you pour clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections can be poured. Castings take a higher polish. Exclusive formula reduces obnoxious gases, improves working conditions. Dross contains no metal after this flux is used.

STEPHEN J. POHL
. . . joins Jackson Iron



A. A. DOBBS
. . . foundry v. p.

BENJAMIN M. PRESTHOLT
. . . division mgr., Link-Belt

RODNEY F. COLTART
. . . Link-Belt division mgr.

(*Continued from page* 127)

to Metal & Thermit in 1951 as manager of its scrap division, and has been a vice president since 1952.

♦ ♦ ♦

Stephen J. Pohl has joined Jackson Iron & Steel Co., Jackson, O., as metallurgical engineer. Mr. Pohl, a graduate of Marquette University, later studied at University of Wisconsin. In 1935 he was appointed metallurgist, Federal Malleable Co., West Allis, Wis., where for the past 6 years he has been foundry superintendent.

♦ ♦ ♦

J. T. AuWerter Jr., who recently joined Acmor Conveyor Chain Co., Cleveland, has been elected president of the company where he will devote most of his efforts to sales activities.

♦ ♦ ♦

Clifford T. Olsen has joined Acheson Colloids Co., Port Huron, Mich., as service engineer. Mr. Olsen was graduated from Lafayette College in 1950, following Navy service, and previously was associated with Hanson-Van Winkle-Munning Co., Matawan, N. J., and Automotive Rubber Co., Detroit, as electro-chemist and sales engineer, respectively.

♦ ♦ ♦

A. A. Dobbs, since 1947 foundry superintendent, Virginia Metalcrafters, Waynesboro, Va., has been named vice president in charge of the foundry. Mr. Dobbs was previously associated with Central Foundry Co., Holt, Ala., and Agricola Furnace Co., Gadsden, Ala.

♦ ♦ ♦

C. D. Galloway has been named works manager, Chambersburg Engineering Co., Chambersburg, Pa. **George H. Martin** has succeeded Mr. Galloway as foundry superintendent.

♦ ♦ ♦

Eugene J. Sullivan has been appointed general manager of the resin and chemical department, Chemical Division, Borden Co., New York, where his duties will include sales, production and development of foundry products. In 1946, Mr. Sullivan joined the division, where his work has been in the packaging and industrial adhesives department.

♦ ♦ ♦

Rodney F. Coltart, recently sales engineer at Link-Belt Co.'s Colmar, Pa., plant, has been appointed sales manager of Link-Belt's central Pacific division with headquarters at San Francisco. **Benjamin M. Prestholt** has been named sales manager of the company's southern Pacific division, with headquarters at Los Angeles. Mr. Prestholt has been with Link-Belt since 1936 in the engineering department of the Caldwell plant, Chicago.

♦ ♦ ♦

William F. Rochow recently was named assistant to the president—research and development, Harbison-Walker Refractories Co., Pittsburgh, as reported in the April issue, p. 142. However, FOUNDRY neglected to mention that Mr. Rochow has relinquished his title of vice president in charge of technical sales and research because of the company's retirement policy.

♦ ♦ ♦

H. W. Campbell has been appointed assistant general manager, Lynchburg Foundry Co., Lynchburg, Va. **Earl R. Viar,** assistant plant manager, has succeeded Mr. Campbell as Lynchburg plant manager. **H. Gordon Moore** has become personnel director and **Marcus C. Elcan** editor of the company publication, *The Iron Worker.*

♦ ♦ ♦

Harry E. Lewis, formerly executive director, Industrial Mineral Fiber Institute Inc., New York, has been appointed general manager of the Insulation Division, M. H.

(*Continued on page* 132)

CLIFFORD T. OLSEN
. . . joins Acheson Colloids

EUGENE J. SULLIVAN
. . . Borden Co. dept. mgr.

Juniata

TRADE MARK REGISTERED

The UNIVERSAL FOUNDRY SAND

FOR SHELL MOLDING

Juniata bank sand has all the required qualities and right grain pattern for shell molding. It has taken an important place in this new field. Specially processed and screened to assure high quality.

- Gives Sharper Profile
- Bonds Adhere Readily
- Rapid Mixing or Mulling
- Uniform Grain Distribution
- Smoother Surface
- Highly Permeable
- No Metal Penetration
- No Clay or Lime Defects

Juniata bank sands are available, either raw or artificially-dried, carefully screened, ranging from 75 to 115 A.F.A. Grain fineness.

FOR CONVENTIONAL CORES AND MOLDS

IN MOLDS:

- Highly Refractory
- Permits Hard Ramming
- Gives Sharper Profile
- Bonds Adhere Readily
- Ideal Facing Sand Base
- Rapid Mixing or Mulling
- Uniform Grain Distribution

IN CORES:

- Free Flowing
- Saves Binders
- Resists Sagging
- Smoother Surface
- Highly Permeable
- No Metal Penetration
- No Clay or Lime Defects

Great Lakes

FOUNDRY SAND COMPANY—DETROIT

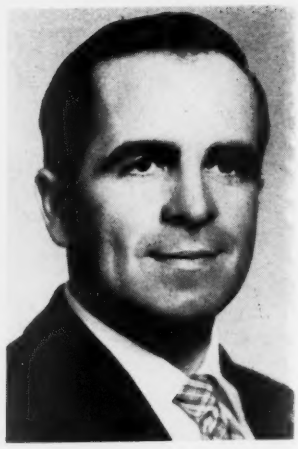
MINERS • PROCESSORS • FOUNDRY, METALLURGICAL AND SAND BLAST SERVICE

FOUNDRY SANDS • SILICA SANDS
SHOT—GRIT—BLAST SANDS
REFRACTORIES • BENTONITE
RE-BONDING CLAYS

AUBREY C. SCHOLLE
. . . Hamilton Foundry foreman

ELMER E. DITTY
. . . heads Federal Foundry

LOUIS H. HEYL
. . . v.p., Federal Foundry



RICHARD G. HARTNETT
. . . joins Acheson Colloids

(*Continued from page* 130)

Detrick Co., Chicago. Mr. Lewis is a graduate mechanical engineer from Purdue University.

♦ ♦ ♦

Aubrey C. Scholle has been named general foreman of the No. 3 foundry, Hamilton Foundry & Machine Co., Hamilton, O. Mr. Scholle has been foundry foreman since he joined the company last year. He attended University of Cincinnati and for 17 years was engaged in foundry supervisory work in Cincinnati.

♦ ♦ ♦

Herbert A. Reece, head of Reecemelt Co., has been elected to membership in the American Institute of Management.

♦ ♦ ♦

Don Watkins has joined Continental Foundry & Machine Co., East Chicago, Ind., as vice president with headquarters at the Pittsburgh offices. Mr. Watkins has been associated with the steel and allied industries more than 30 years.

Elmer E. Ditty, formerly secretary, has been elected president, Federal Foundry Supply Co., Cleveland, succeeding his father, the late Ralph Ditty. He joined the company in 1927. **Louis H. Heyl** has been named executive vice president-general manager and **George E. Tate** has been re-elected treasurer. **Peter Reed** has been elected secretary and a director.

♦ ♦ ♦

Aaron A. Leudtke, assistant superintendent, has been appointed superintendent of the foundry, J. I. Case Co., Racine, Wis. Mr. Leudtke has been with the company 25 years.

♦ ♦ ♦

Charles H. Palmer Jr., engineering representative in western Pennsylvania, Virginia and West Virginia for Newaygo Engineering Co., Newaygo, Mich., has been transferred temporarily to New Orleans as resident engineer for Newaygo on a cylinder head foundry being built at the Michoud Ordnance Plant for the Corps of Engineers.

Richard G. Hartnett has been appointed service engineer in Ohio for Acheson Colloids Co., Port Huron, Mich., with headquarters in the Cleveland office. Mr. Hartnett attended John Carroll University and was previously associated with Federal Foundry Supply Co., Cleveland.

♦ ♦ ♦

Peter D. Kleist has been elected a director of Mercast Corp. of New York, New York, which engages in development, research, production and licensing activities of its patented frozen mercury process for producing precision castings. Mr. Kleist formerly was president of Industrial Metal Casting Corp., Cleveland, which Mercast Corp., recently acquired.

♦ ♦ ♦

Marvin M. Brown was recently appointed vice president-sales, Love Brothers Inc., Aurora, Ill., and its associated foundries.

♦ ♦ ♦

C. A. Hamilton has been appointed general manager, Wm. E. Pratt Mfg. Co., division of Joslyn Mfg. & Supply Co., Joliet, Ill., succeeding **Frank Clark,** who has left the company.

♦ ♦ ♦

James D. Dacus Jr. has joined the Cleveland office magnesium sales staff, Dow Chemical Co., Midland, Mich. A graduate of University of California, Los Angeles, Mr. Dacus was previously associated with Douglas Aircraft Corp., El Segundo, Calif.

♦ ♦ ♦

Frank L. Feltes has been elected president, Allyne-Ryan Foundry Co., Cleveland, succeeding the late Ralph G. Sweeney. Mr. Feltes was general superintendent for the past 15 years. **James R. Callahan,** a director, has

(*Concluded on page* 135)

DON WATKINS
. . . joins Continental Foundry

CHARLES H. PALMER JR.
. . . Newaygo resident engineer

THE NEW SHELL **FORMATIC**

presents a new concept in shell molding machines

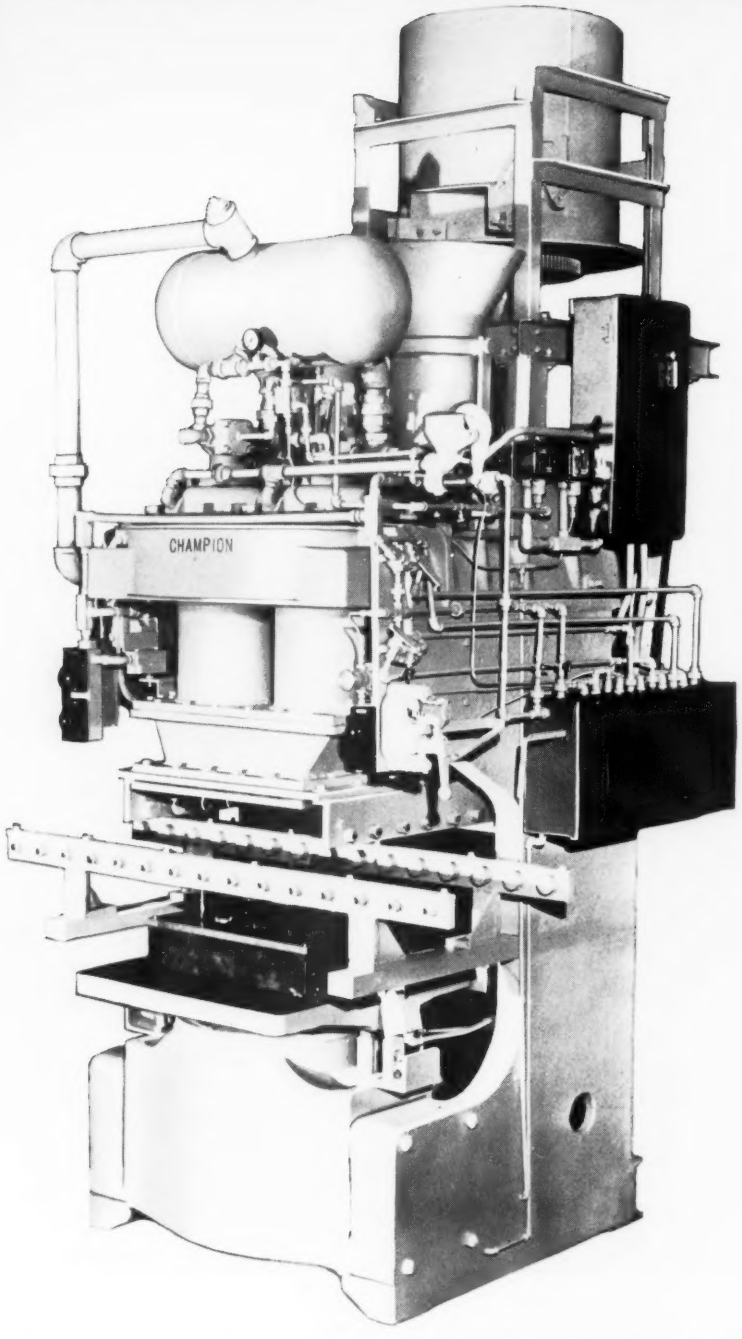
Now it's possible for a foundry to make a *modern* shell mold machine installation with an initial investment of only a little more than that required for crude ineffectual dump box equipment. The new B&P shell Formatic machines feature "*unit package*" construction. The foundry starting on their shell molding program can install only those components that are actually necessary. Then they can add units and features as their program is enlarged, and so pay for their shell molding mechanization with shell molding profits.

The simple "*unit package*" components offer all of the important features of the complete rotary unit illustrated. These include fully automatic sand box, curing furnace, and stripper unit controls. The complete automatic rotary shell Formatic unit, incorporating these components, is available for production rates of up to four shells per minute and pattern sizes of 24 x 30 inches and larger. Write today for information. *Beardsley & Piper, Div. Pettibone Mulliken Corp., 2424 N. Cicero Avenue, Chicago 39, Illinois.*

new!

B&P MBS-20 MOLD BLOWER

designed for top production of repetitive molds



BLOWS AND SQUEEZES COPE OR DRAG IN A SINGLE AUTOMATIC OPERATION . . . HANDLES UP TO 4 MOLDS PER MINUTE

Designed for those production foundries that must have maximum output of molds from a single pattern, or from several such patterns, the new MBS-20 Mold Blower will outperform any molding machine. Mold sections up to 24 x 36 inches are handled and up to four complete molds can be produced each minute. From the moment the flask is rolled into the machine, until pattern is drawn from the blown and squeezed mold, all operations are fast and automatic. Molds are perfectly uniform and true to pattern.

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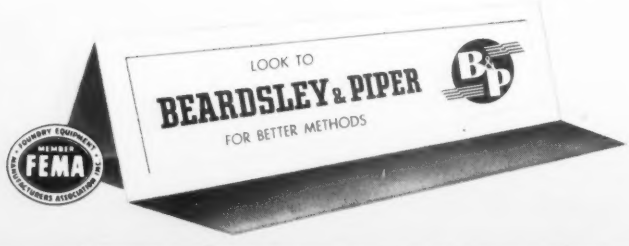


(*Concluded from page* 132)

been made chairman of the board. **John M. Sweeney** has been named a director and **Gabriel R. Friedl**, treasurer.

♦ ♦ ♦

Harold L. Heuser has been placed in charge of merchandise sales in the Cleveland area, Mathews Conveyer Co., Ellwood City, Pa. Mr. Heuser was graduated from Western Reserve University and later studied at Fenn College. In recent years he has been engaged in engineering and sales activities with General Motors Corp., Detroit, Pomeroy Stereograph Co., and Unistrut Service Co. of Ohio, Cleveland, and Whirlpool Aircraft Division, La Porte, Ind.

♦ ♦ ♦

William J. Bulman has been appointed assistant to the executive secretary, National Foundry Association, Chicago. Mr. Bulman was graduated from Seton Hall College and also attended Syracuse University and Fordham University. For the past 3 years he has been a special agent, Federal Bureau of Investigation, in New York, Washington, Cleveland and Oak Ridge, Tenn.

♦ ♦ ♦

Hans J. Heine, since last July assistant technical director, was recently appointed technical director, American Foundrymen's Society, Chicago. Born in Berlin, Germany, Mr. Heine was graduated from the Institute of Technology there. Following postgraduate work at Carnegie Institute of Technology, in 1938 he joined the New Kensington, Pa., plant of Aluminum Co. of America. Following military service, during which he rose to rank of captain in the Ordnance Department, he became associated with Rockwell Mfg. Co., where he was engaged in chemical and metallurgical research, development and plant control work at its Pittsburgh and Barberton, O., plants. In 1948 he was appointed chief metallurgist for all Rockwell plants east of Chicago.

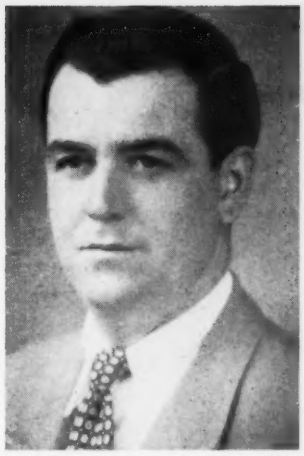
♦ ♦ ♦

Dr. John T. Rettaliata, president, Illinois Institute of Technology, was recently elected a director of American Steel Foundries, Chicago.

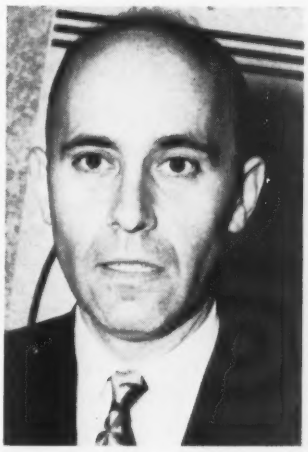
♦ ♦ ♦

Paul B. Brown has been appointed president-general manager, Peninsular Grinding Wheel Division, Detroit, and a director of the parent company, Abrasive & Metal Products Co. In addition he was made president, Peninsular Grinding Wheel Sales Corp., a subsidiary. Mr. Brown joined Peninsular in 1953, as vice president-general manager. Previously he was with Norton Co., Worcester, Mass., and the Carborundum Co., Niagara Falls, N. Y.

HAROLD L. HEUSER
. . . joins Mathews Conveyer



WILLIAM J. BULMAN
. . . NFA executive assistant



HANS J. HEINE
. . . AFS technical director

C. A. BRASHARES
. . . Harbison-Walker sales mgr.

♦ ♦ ♦

C. A. Brashares, since last September assistant general sales manager, Harbison-Walker Refractories Co., Pittsburgh, has been appointed general sales manager. Following graduation from Case Institute of Technology in 1928, Mr. Brashares joined Harbison-Walker, where he worked in the research department and later as sales engineer. He became Birmingham district sales manager in 1948.

♦ ♦ ♦

Dr. William J. Harris has been appointed consulting scientist, Battelle Memorial Institute, Columbus, O., where he will serve in a liaison capacity between the institute and its sponsors in government and industry. For 3 years Dr. Harris has been executive secretary, Minerals and Metals Advisory Board, National Academy of Science and National Research Council. He was graduated from Purdue University and received the degree of doctor of science from Massachusetts Institute of Technology.

♦ ♦ ♦

Arthur Kuiper, treasurer, Continental Foundry & Machine Co., East Chicago, Ind., was recently elected a director, succeeding **William B. Todd,** former executive vice president who retired last year.

♦ ♦ ♦

Robert B. Neumann, until recently associated with Union Mfg. Co., New Britain, Conn., has been appointed project engineer in the Coshocton, O., plant, James B. Clow & Sons, Chicago.

♦ ♦ ♦

Ernest K. Mann Jr., vice president-controller, Bohn Aluminum & Brass Corp., Detroit, has been elected to membership in Controllers Institute of America, New York.

♦ ♦ ♦

Jack H. Silverman, formerly president, Advance Metal Products Corp., Chicago, has been appointed Chicago district sales manager, Detroit Brass & Malleable Works, Detroit.

Convention and Exhibits

(*Continued from page* 90)

tional purposes at the high school level.

The evening was concluded with an enjoyable program of professional entertainment.

Other evening social events included the annual Canadian dinner and the AFS Alumni dinner. The latter, with a large number of present and past officers and directors, medalists and honorary life members in attendance, was presided over by I. R. Wagner, immediate past president of AFS. The program included brief remarks by Thomas W. Pangborn and showing of pictures taken during last year's International Foundry Congress tour by Victor E. Zang, vice president, Unitcast Corp., Toledo, O.

BRASS and BRONZE

MANY aspects of current brass and bronze practice were discussed in three technical sessions and a roundtable luncheon. These included gating of yellow brass, shell and pressure molding, valve stem dezincification, chill applications, melt quality testing, and metal penetration.

About 150 persons gathered at the first session to hear two papers, **Ornamental Yellow Brass Castings Gated for Greater Economy** by C. L. Mack, Chautauqua Hardware Corp., Jamestown, N. Y., and **Some Experiences in the Shell Molding of Copper-Base Alloys** by S. S. Brown and H. K. Worner, W. O. & B. Adams Pty. Ltd., Melbourne, Australia. In the absence of the authors, the latter paper was delivered by B. N. Ames, Doran Manganese Bronze Corp., Brooklyn, N. Y.

Mr. Mack reported on the work done by his company in purchasing several hundred gated patterns and regating them so that, for their purposes, castings of very intricate design with thin sections could be poured more economically and efficiently. Intensive study of technical literature and the recorded experiences of other foundrymen was combined with company know-how in arriving at improved techniques for gating, risering and pouring of top-quality yellow brass furniture hardware castings while maintaining a minimum rejection percentage.

The paper read by Mr. Ames pointed out the experiences of the authors in the shell mold mass production of small and medium size copper-base alloy castings requiring fine surface finish and accuracies within 0.003 in. Cost advantages of the method are realized by elimination of some machining operations on the finished casting. Sand of AFS 120 or finer will produce good surface finish. Correct ingating and feeding are essential to maintain dimensional accuracy and avoid shrinkage.

Four papers featured the second brass and bronze session and all were related to research in progress. In the first paper, W. H. Baer, Bureau of Ships, Navy Department, Washington, explained that the Bureau places contracts for research to be conducted and currently three are under way. One is that of revising and bringing up to date a Bureau of Ships foundry manual issued several years ago. Battelle Memorial Institute, Columbus, O., has this contract, and the manual, to be available in about six months, will be far superior to the original.

Second contract, to Stemac Inc., Chicago, is to determine the cause and effect of porosity in gunmetal pressure castings. Armour Research Foundation, Chicago, is assisting in this project. This type of casting is purchased regularly by the Bureau from a number of makers. Production of castings and research are being combined in the Stemac operation. The castings are suction head type, weighing about 40 lb net and about 80 lb with gates and risers. Although work has been under way about a year, it is in no way complete.

Bureau of Ships suffers considerable loss and breakage of propellers for small boats from 20 in. diameter up. Consequently a contract has been given to Columbian Bronze Corp., Freeport, N. Y., to ascertain if it is possible to make expendable propellers using the shell mold technique. If one is broken, another could be made readily.

Valve Stem Dezincification was discussed in a paper by R. H. Hanlon, Kennedy Valve Mfg. Co., Elmira, N. Y. Dezincification is a form of corrosion resulting in loss of zinc from the alloy. Research on the matter has been pursued about two years but Mr. Hanlon limited his presentation to some recent accelerated tests in which stems of various alloys were immersed in weak chemical solutions for ten weeks. Silicon brass seemed to give the best service life.

The speaker pointed out that much of the trouble in deteriorating valve stems comes from drinking water at ground temperature. Tests show the water to contain nothing destructive. Mr. Hanlon stated that it is very difficult to simulate actual conditions in laboratory research.

T. E. Barlow, Eastern Clay Products Department, International Minerals & Chemical Corp., Chicago, contributed a paper on **Pressure Molding for Copper-Base Alloys.** Normally, pressures in molding are in the neighborhood of 10 to 15 psi, the speaker observed. In high-pressure molding, pressures will range from 80 up to 600 psi. The pressure is applied to the mold through a rubber diaphragm, and success of the procedure depends upon proper sand flowability.

More energy must be put into the mold than the metal uses in tearing it apart. High-pressure molding has for its objective the production of better castings with close dimensional tolerances. Therefore, the equipment used must be built with precision and must be able to withstand the pressures to which it is subjected.

A progress report on porosity in copper-base foundry alloys was presented by Clyde Adams, Massachusetts Institute of Technology, Cambridge, Mass. In the absence of H. F. Taylor of the Institute, he reviewed the paper, **Melt Quality Tests for Bronze Alloys,** prepared by the latter. Porosity as the effect of gases in wedge samples of metal was described. It was stated that the defects can be exaggerated by pouring the specimens under reduced pressure, as in a bell jar.

Mr. Adams emphasized that there is plenty of room for more work on this subject. Carbon also can be detrimental in causing porosity, the source of the carbon likely being the mold if oxygen is present in the metal.

Third brass and bronze session embraced two papers of research

(*Continued on page* 139)

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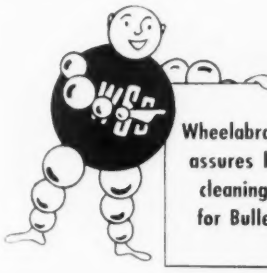

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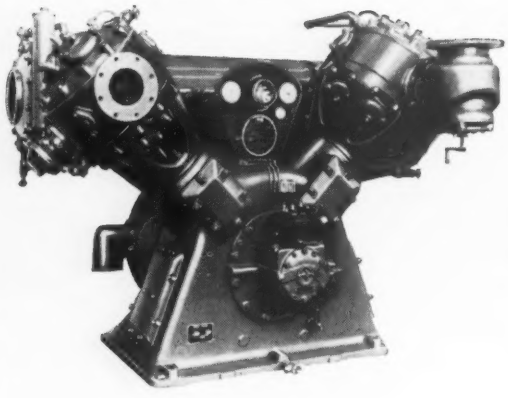

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(*Continued from page* 136)

character. **Application of Chills to Improving Pressure Tightness of Gun Metal (88-8-4),** by W. H. Johnson, H. F. Bishop, metallurgists, Metal Processing Branch, and W. S. Pellini, head of the Metallurgy Division, Naval Research Laboratory, Washington, and presented by Mr. Bishop, evaluated the feeding range of gunmetal on the basis of pressure tightness developed in a bar casting at various distances from a riser.

Measurements of thermal gradients developed during solidification of the casting provided information as to the degree of directional solidification required to develop pressure tightness. Melt quality was shown to be an important factor; metal which contains gas requires a greater degree of directional solidification to produce soundness.

By application of chills in a novel manner, according to Mr. Bishop, it was possible to accentuate the degree of directional solidification to the extent that even gassy metal may be made pressure tight. This was demonstrated for the difficult case of thin-walled bushings which cannot be made consistently pressure tight even with good quality metal of low gas content when cast without chills. The usual practice of using end chills was demonstrated to be ineffective for purposes of increasing feeding range and overcoming the effects of gas.

In discussion, H. M. St. John, Crane Co., Chicago, said that a production foundry making a large number of castings cannot afford to use either insulators or chills if this can possibly be avoided. The answer, in his opinion, must be found in working out proper casting design and molding procedure. Several other discussors indicated it is becoming evident that use of chills is a requisite in producing pressure tightness.

In the second paper, **Some Factors Affecting Metal Penetration of Navy M Bronze in Cores,** R. B. Fischer, metallurgist, Ingersoll-Rand Co., Phillipsburg, N. J., reported results of an investigation initiated in 1943 covering the effects of sands, sand additives and coatings on metal penetration. Comparative observations were made on a specially-designed casting and results on over 35 test specimens were recorded photographically.

Among conclusions related by Mr. Fischer were that metal-static pressure, or head influences penetration. Permeability of the core mixture affects metal penetration. Sand mixtures that satisfactorily resisted metal penetration had low permeability. Best of the low permeability mixtures was the fine grade of zircon sand (AFS fineness 110). Severity of penetration increased as the permeability increased. Providence core sand mixtures, having low permeability, approached zircon in resistance to penetration but were not consistently equivalent.

Some other conclusions were that sand additives show some benefit in resistance to penetration when added to low permeability base sands. However, they do not benefit the coarser sands, unless a drastic reduction is made in permeability by their additions. Core washes improve the surface finish if applied to a good penetration resistant base sand such as zircon. However, they will not completely eliminate penetration on high-permeability sands such as No. 120 or No. 60 silica.

Reports of division committees at the Brass and Bronze Division roundtable luncheon were followed by a lively discussion led by B. A. Miller, Crown Non-Ferrous Foundry Inc., Chester, Pa. A mimeographed list of prepared questions was supplied each one attending. Before the general discussion period a vote was taken to determine those questions creating the greatest interest.

These were the questions upon which discussion was preferred: Why aren't synthetic sands used more extensively than natural bonded sand in the molding for brass and bronze alloys? What problems are encountered in melting and casting the high tensile bronzes? Aluminum bronzes? Manganese bronzes? Silicon brasses? What are the economics involved in the casting of copper-base alloys in the "D" and "C" processes and high-pressure molding?

PLASTER MOLD CASTING

APPROXIMATELY 100 persons gathered at the plaster mold casting session to bring themselves up-to-date on methods of improving the thermal conductivity and economy of foam plaster, practical applications for expansion plaster, and a run-down on the history and development of the process.

R. F. Dalton, Hills-McCanna Co., Chicago, in his paper **Improving the Thermal Conductivity and Economy of Foam Plaster Molds,** pointed out that foam plaster has the advantages of high permeability and low heat conductivity, making it an ideal medium in casting thin aluminum sections at temperatures around 1250°F. External chills can be used in the plaster mix to cast heavier sections. Mold density can be increased by adding clean silica sand to the mixture. For the same pour, it is essential to make the entire batch at once because, depending upon the quantities mixed, each batch has its own characteristics.

For best results while mixing, the following suggestions were offered: All of the plaster slurry should be in motion in the mixing container; the mixer should be capable of reaching the bottom of the container; the mixer should rotate fast enough to allow air to enter within a reasonable length of time, and the slurry should mix long enough to "cream."

Some Practical Applications for Expansion Plaster were offered in the paper presented by O. H. Harer, Scientific Cast Products Corp. of Illinois, Chicago. Experiments and use have shown that medium, medium high, and high expansion plasters can be used with great accuracy and considerably reduced pattern costs in making matchplate patterns. Thicknesses up to 4 in. will expand evenly on all sides and in all directions. Patterns can be pulled as soon as the plaster "sets up"—a point determined by sight and feel. For a parting agent, soluble oil with mica dust or a slightly heated lacquer release agent will work satisfactorily. In his experiences, the author did not use pattern vents, although others have with some success.

K. A. Miericke, Baroid Sales Division National Lead Co., Chicago, carried the **History and Development of Plaster Mold Casting** from the ancient Egyptians and Chinese, to the 16th century Italians, to the late 1890 era when dentists used the process in the manufacture of false teeth, and to today's advanced methods and practices which are constantly being improved as experience is gained. Mr. Miericke pointed out that because of the heat and chemi-

cal factors involved, the ferrous metals are not compatible with the plaster process. Aluminum and stainless steel can readily be cast in plaster molds while zinc alloys and magnesium can be poured but with difficulty. Once the plaster mold is used the materials cannot be reclaimed for reuse.

LIGHT METALS

FOUR technical sessions and a luncheon comprised the Light Metals Division program. Among subjects discussed were aluminum, titanium and magnesium alloys for sand, centrifugal and die casting; gating, and fluid flow studies.

The first paper, **Gating and Risering of Magnesium Alloys,** by H. E. Elliott, Dow Chemical Co., Bay City, Mich., dealt with casting defects that arise from faulty gating and risering practice and ways of avoiding them. The author particularly stressed the use of a gating system which prevents turbulence and consequently minimizes formation of dross which can be carried into the casting cavity. To avoid spurting into the cavity, metal should flow in quietly through ample sized ingates.

It was suggested that total cross-sectional area of channels leading from the sprue base be about double that of sprue cross section, and the total ingate area into the casting cavity at least double the sprue cross-sectional area.

Separation of any dross formed in the metal stream can be achieved by use of strainers at the sprue base and by taking advantage of the dross' tendency to float on a quietly flowing metal stream and allow it to be skimmed off on the cope side of runners.

The runner should feed a vertical, cylindrical well containing a tubular screen through which the metal flows. Ingates from the well may be of the slot type, bottom gates with hot shots to the riser or step gates. Or the well may be used as a riser with junctions into various sections of the casting at intermediate levels.

Avoidance of microporosity due to inadequate thermal gradients can be achieved by wider spacing of risers, heavy chilling of the casting, avoiding excessive flow of metal through the casting, slow filling of a vertical cavity with direct pouring of the last metal into a top riser, and avoidance of excessively high pouring temperatures.

During discussion it was pointed out that some of the risering methods suggested might pose a cleaning room problem, but it was agreed that compromises always are necessary to achieve a sound casting and still keep cleaning problems at a minimum. It also was agreed that a given gating system will not work for all alloys but must be adjusted for the various alloys and for casting design.

Second paper, **Segregation in Magnesium—Rare Earths—Zinc—Zirconium Alloys,** by H. M. Skelly, Aluminum Laboratories Ltd., Kingston, Ont., and D. C. Sunnucks, Aluminum Co. of Canada, Montreal, was presented by Mr. Sunnucks. The paper dealt with studies of a test casting designed to induce segregation and poured with EZ33 alloy, consisting of 3 per cent rare earth metals (cerium mischmetal), 3 per cent zinc, 0.7 per cent zirconium and the balance magnesium.

It was shown that segregation causes no important loss of ultimate strength, elongation or yield strength, creep resistance or fatigue strength. Although segregation of various kinds is common in other alloys, it seldom shows up in radiographic inspection to a point that it creates a problem in inspection of castings.

Even though segregation does not affect critical properties, foundry techniques which promote segregation should be avoided because they can cause shrinkage, cracks or other open voids in castings.

In the discussion, C. E. Nelson, Dow Chemical Co., Midland, Mich., stated that he had achieved segregation in tests with EK41A alloy with no effect on properties.

The speaker pointed out in answer to a question that the amount of segregation has no effect on mechanical properties. He also pointed out that no tests were made on segregation effect on corrosion resistance.

Beryllium in Magnesium Die Casting Alloys, by F. L. Burkett, Dow Chemical Co., Midland, Mich., was the subject of the third paper. The speaker pointed to some useful effects of beryllium in magnesium die casting alloys: 1. Minute quantities help reduce oxidation of the metal because beryllium concentrates on the surface and prevents contact of metal with the air. 2. It may be used as a hardener, and is added in the ladle by submersing it in the melt. Solubility is about 40 per cent and an addition of about 0.0007 per cent of the melt constituent can be achieved. Additions are made at a temperature of 1300-1400° F. Beryllium is added in the metal form use of beryllium salts is hazardous

When beryllium content drops below 0.0003 per cent it has no beneficial effect. Salt water corrosion rate and mechanical properties, with the exception of elongation, are unaffected by beryllium additions. Per cent of elongation is reduced as beryllium content gets above 0.0003. No casting difficulties are traceable to the additions.

Beryllium has no effect on grain size of die cast alloys because of the fast chilling effect of the die. However, its use in sand or permanent mold work is not recommended.

Two papers were presented at the luncheon session. The first of these, **Principles of Vertical Gating,** a progress report on light metals research, was in the form of a film with commentary by J. G. Kura, Battelle Memorial Institute, Columbus, O. Tests were conducted by pouring water into a Lucite mold and photographing the action with a high-speed camera. The study is aimed at procedures for permanent and shell molding processes because these molds often are poured vertically.

Conclusions reached at this point in the study are that sprues should have twice the cross-sectional area at the top that they do at bottom. Sprues should enter the bottom of a vertical side riser attached to the mold cavity by a continuous web section. This minimizes turbulence in the mold cavity and helps direct last metal poured to the top of the casting.

Enlargement of the runner at sprue base helps decrease jet effect of the liquid. Runner cross section should be larger than that of the sprue. Cross section of the side riser and connecting web should be as large as feasible to decrease undesirable cascading type of flow from the side riser into mold cavity. Extension of the runner past the gate absorbs some kinetic energy of the liquid and decreases jet effect when the stream enters the side riser.

With a properly designed gating system, clean castings can be achieved when the sprue is filled rapidly. Pouring, therefore, does not depend on skill of the pourer.

Further work will include pouring aluminum alloy castings using these principles to demonstrate practical applications.

Second paper, **A Technique for Improving Quality of Investment Castings,** by D. G. McCullough, F. J. Web-

(Continued on page 142)

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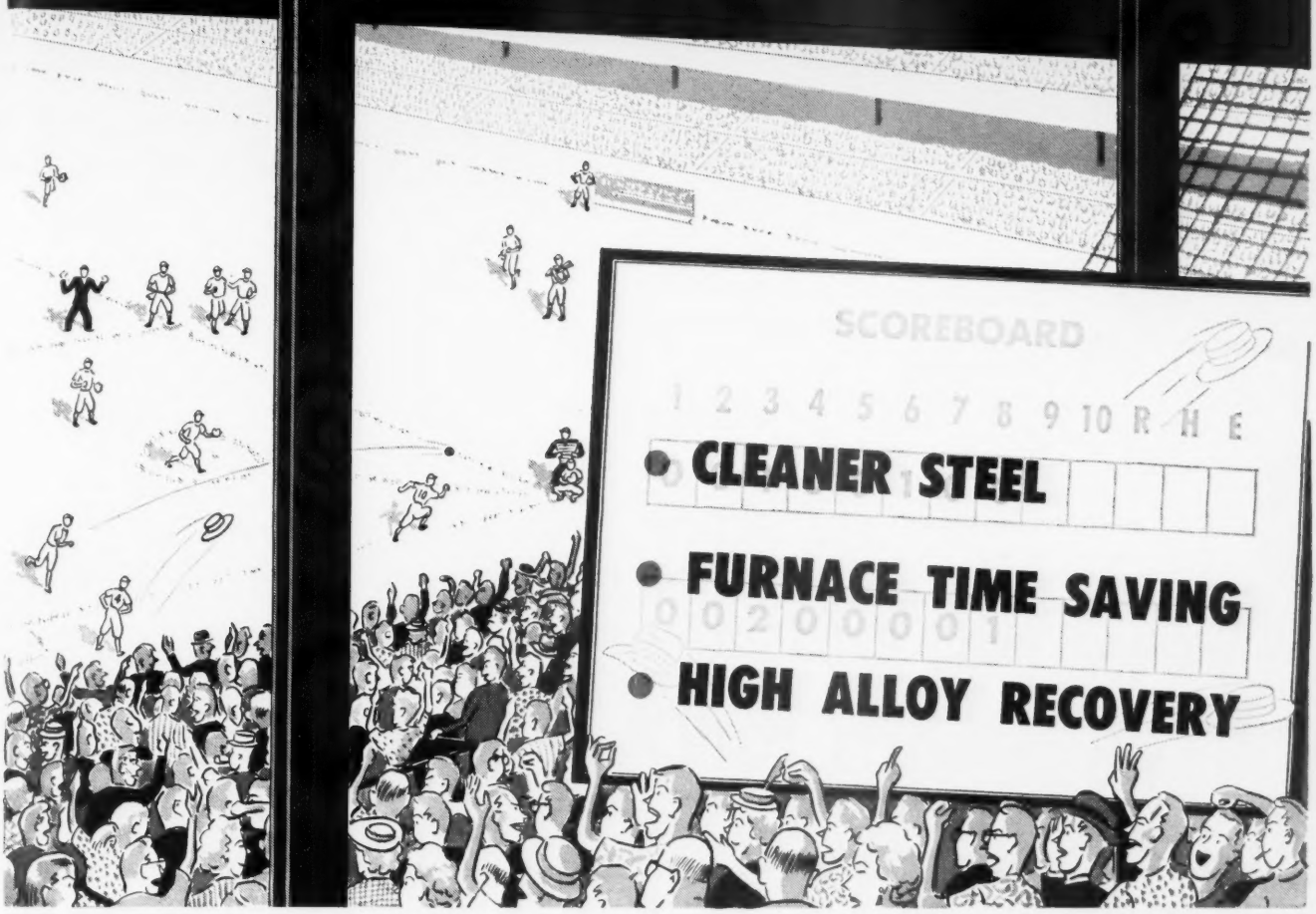

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(*Continued from page* 140)

bere and R. F. Thomson, General Motors Research Laboratories, Detroit, was presented by Mr. McCullough. The paper reported on studies of fluid flow characteristics in transparent plastic molds to develop an investment cast test bar of suitable soundness to obtain properties representative of those inherent in alloy GMR-235 developed by General Motors Corp. for use in jet engine components. Percentage constitutents of this alloy are: C—0.15, Mn—less than 0.10, Si—less than 0.60, Cr—15.5, Mo—5.25, Fe—10.0, Al—3.0, Ti—2.0, B—0.075, and Ni—balance.

Successful completion of this project led to studies of gating arrangements for other investment castings. A technique was developed for casting irregular shapes into transparent plastic, thus avoiding the problem of reproducing difficult-to-machine cavities in solid plastic.

Patterns of the oddly-shaped parts were produced in the low-melting alloy: 50 per cent Bi, 26.7 Pb, 13.3 Sn and 10 Cd. Patterns were assembled in a glass flask after suitable surface finish was attained by polishing. Then a liquid, cold pouring, thermosetting polyester resin was cast around the patterns. When the resin had solidified the plastic was heated until the metal patterns melted and drained from the cavity. Metal residues were leached with acids.

New Aluminum Die Casting Alloys, by D. L. Colwell and E. Trela, Apex Smelting Co., Cleveland, led off the second light metals session. The paper was delivered by Mr. Colwell. The authors devoted the bulk of it to a discussion of two modifications of standard aluminum die casting alloy 39. These modifications provide for an increase of the alloy's silicon content to 11 per cent and an increase of its zinc content to 2½ per cent, in the interests of improving castability.

As modified, the alloy possesses the same corrosion resistance. Yield and tensile strengths and hardness are higher, and impact strength and elongation slightly lower. Because scrap can be used, metal cost is lower, yet properties and foundry behavior are not harmed. Casting cycle is not lengthened, since lower casting temperature compensates for lengthened cycle.

Discussion brought out that the modifications do not increase hot cracking. Hot charging avoids hard spots with this alloy, although care must be taken to avoid elemental silicon in the metal. Although no data exist on the effect of the increased zinc on aging heat treatment, no effect is known.

D. G. McCullough, General Motors Research Laboratories, indicates the point where fluid enters the mold cavity as the principal location of turbulence in a conventional gating system for the multiple-gated turbine casting shown at lower right. Mr. McCullough presented a paper at the Light Metals Division luncheon describing experimental work on fluid flow in plastic models of investment molds. The report on his paper is included in this section

The second paper, **Mechanical Properties of Aluminum Die Casting Alloys,** by C. O. Smith, Aluminum Research Laboratories, Aluminum Co. of America, New Kensington, Pa., reviewed existing information on typical static and dynamic properties of commercial aluminum die casting alloys and presented new data. Nine alloys were considered, but most of the discussion concerned SC84 B alloy, which is the same as Alcoa 380 alloy. Representative of the die casting alloys, it is used about four times as much as the other eight types combined.

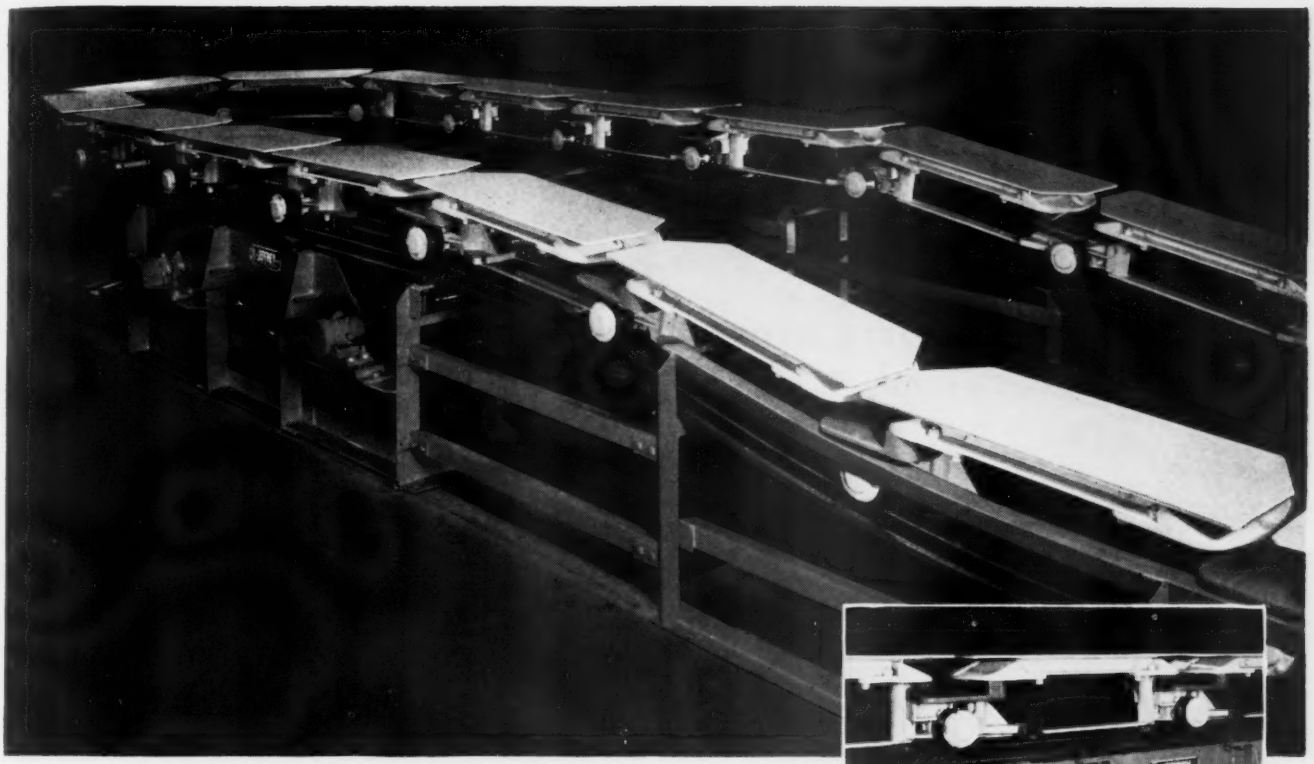
An improvement in tensile properties of 380 alloy results from artificial aging after it has been heated at 212° F for extended periods of time. This aging behavior occurs in varying degrees in all aluminum die casting alloys. Notches may have a detrimental effect on die castings under stress, whether as-cast or machined. Die castings can be used in many applications requiring stress and will perform as well as or better than permanent mold or sand castings for many applications. Fatigue strength and end limit are better in die castings.

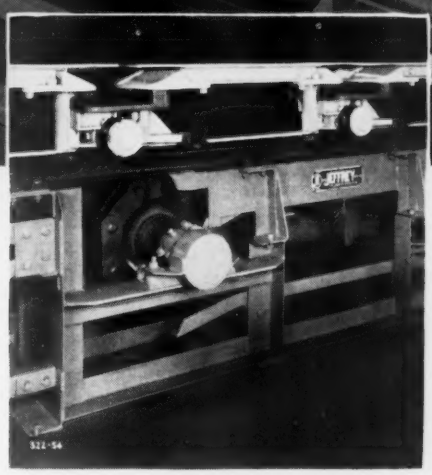
Discussion centered around the possibility that the rapid chill of the skin in die castings gives them a high strength which is lost if the skin is removed.

Final paper at this session was **Some Factors Affecting Fatigue Strength of Aluminum Alloy Sand Castings,** by Marshall Holt, Aluminum Research Laboratories, Aluminum Co. of America, New Kensington, Pa. Plate specimens provided the basis for the tests, data from which are applicable to aluminum alloys in general. These data were obtained in direct-stress fatigue tests and are not directly comparable with data from rotating beam fatigue tests.

Results of the tests showed that fatigue strength of plate type specimens is generally less than that of small "metallurgical type" specimens machined from separately cast test bars or from the butt ends of the plate type specimens. Discontinuities such as gas porosity, sand holes and dross inclusions have no significant effect on fatigue strength. Transverse metallic and large dross inclusions detract slightly from the fatigue strength of otherwise commercially sound aluminum alloy sand castings. Effects of sand holes depend on their size and location. Located at an edge, they reduce fatigue strength. Effect of repairing a casting by welding depends on size and location of the area affected. Fatigue strength of a casting with sand holes at an edge apparently can be increased by fill-

(*Continued on page* 145)





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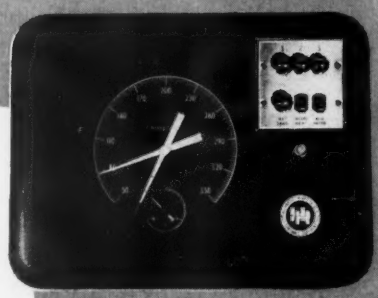

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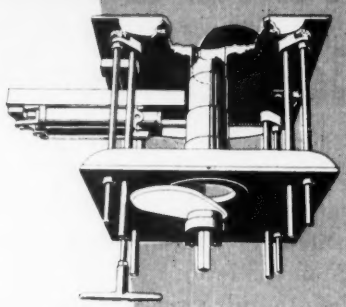

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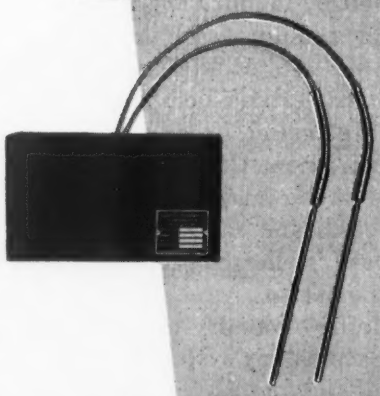

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(*Continued from page* 142)

ing the holes with weld metal.

Discussion revealed that in welded specimens, fair welds held up better than good ones, for reasons not known. The observation was made that perhaps requirements commonly made on castings should not be so stringent as they are.

Two papers were presented at the third light metals session. The first, **Effect of Centrifugal Force on the Structure and Mechanical Properties of Aluminum Casting Alloy C4,** by O. Z. Rylski, A. Couture and J. W. Meier, Dept. of Mines & Technical Surveys, Ottawa, Ont., was presented by Mr. Couture.

Testing procedure consisted of molding and solidifying the alloy in an electrically heated, elongated mold mounted horizontally on a centrifugal casting machine. Resultant castings were examined by x-ray and under the microscope, subjected to chemical analysis and tested for mechanical properties. Results indicated that the castings had a characteristic zoned structure. Metal in the peripheral zone was fine-grained, of lower density and lower copper content, but showed less shrinkage and porosity than the zone near the center of rotation. The latter zone had higher hardness but lower mechanical properties. The test mold was rotated at speeds from 200 to 900 rpm, and at speeds above 700 rpm the mechanical properties of the test castings exceeded those of castings produced under the same conditions but without rotation. Below 700 rpm the properties were lower.

In a written discussion, Walter Bonsack, Christiansen Corp., Chicago, suggested that experiments should be conducted with an alloy containing no grain refiner because it influences results.

Techniques for Improving the Strength and Ductility of Aluminum Alloy Castings by W. D. Walther, Ford Motor Co., and C. M. Adams and H. F. Taylor, Massachusetts Institute of Technology, Cambridge, Mass., were discussed by Mr. Walther.

The paper covers tests with 195 alloy to study effects of thermal gradients with different size risers, chills and exothermic heads. Test castings were poured with metal from which gas had been eliminated in a reduced pressure atmosphere. Mold materials used which offered less chance for gas pick-up in the order mentioned were green sand, core sand, shell molds, and dry sand. The test casting was a 5 x 8 x ¾-in. plate.

Results indicated that increasing riser size over the proper minimum size selected had no effect on mechanical properties of the casting. Use of chills increased tensile strength and elongation slightly but had no effect on grain size. When no chills were used, grain refinement processes increased mechanical properties about 25 per cent. Use of exothermic materials in the riser was found to push gas into the metal.

It was concluded that grain refinement is beneficial under conditions of low thermal gradient (no chill) and of little use in high thermal gradient castings (with chill).

Melting and casting of titanium was headlined at the fourth and final light metals session. O. W. Simmons, metallurgist, Rem-Cru Titanium Corp., Midland, Pa., presented the first paper, **Arc Type Furnace for the Melting and Casting of Titanium,** one which he had co-authored with H. R. McCurdy, physical science aide, and R. E. Edelman, metallurgist, Pitman-Dunn Laboratories, Frankford Arsenal, Philadelphia. Object of their study was to construct a furnace in which a 10-lb heat could be melted and poured free of contamination. A direct-current arc, bottom-pour furnace was developed.

Maximum heat produced was 13.5 lb from a 25-lb charge; thus heat-to-charge efficiency was 54 per cent. The furnace consists of a water-cooled copper crucible and a separate mold cavity. The whole apparatus is surrounded by a gas-tight chamber with appropriate water cooling.

The heat is introduced by an arc struck between a water-cooled tungsten-tipped electrode and the titanium charge. An argon-helium atmosphere protects the molten titanium from gaseous contamination. Machined graphite is used as the mold material. A 3-in.-square molybdenum sheet 0.002-in. thick acts as a plug to prevent premature pouring of the molten metal.

Two special features incorporated in the lower part—the mold chamber—of the furnace are intended to facilitate pouring of the titanium into the graphite mold. One feature is a resistance heater for preheating the graphite molds to reduce their chilling effect. The other is an evacuating mechanism which draws the gases out of the chamber at the instant of pouring. Since the upper chamber is at approximately atmospheric pressure, the metal is sucked into the mold, thus supplementing the gravitational effect.

Mechanical Properties of Cast Titanium-Aluminum Alloys was title of a paper authored by R. E. Edelman and A. Tabak, Pitman-Dunn Laboratories, Frankford Arsenal, Philadelphia, and presented by the former. It was explained that aluminum was selected as the alloying element with titanium because it is light and will not increase the density of titanium. Most of the tests and study of properties were on alloys containing 6 to 7 per cent aluminum and some around 10 per cent. Aluminum up to 36 per cent has been added but the resulting material is very brittle.

MICHIGAN STATE COLLEGE Student Chapter of the AFS recently opened its annual membership campaign with an information booth and display in the college engineering building. Members manned the booth and explained the chapter's functions and activities to interested students. Emphasis was placed on engineering opportunities in cast metals as well as the advantages of belonging to the student chapter. Seated at the booth are Bruce Harding, student chapter chairman, left, and Jacob Goldberg, explaining membership requirements to a fellow student (standing)

A paper by R. M. Lang, principal metallurgist, J. Gissy, principal chemical engineer, G. H. Schippereit, assistant chief, and J. G. Kura, chief, Nonferrous Metallurgy Division, Battelle Memorial Institute, Columbus, O., and presented by the first named, dealt with **Expendable Molds for Titanium Castings.**

Graphite shell molds are the most satisfactory expendable molds developed thus far, it was stated. Good surface finish and complete freedom from pinholes were obtained on section thickness up to and including 2 in. All such castings, however, had surface layers of contaminated metal.

Titanium castings made in various refractory oxide shell molds showed pin-holing, Mr. Lang reported. Use of chemical inhibitors in the mold mixtures reduced but did not eliminate pin-holing. Castings made in an alumina shell mold containing magnesium silicofluoride were of superior surface finish and showed less pin-holing than those made in either silica, zircon, or zirconia shell molds.

Uses of inhibitors in alumina shell molds, however, did not prevent the occurrence of pin-holes on cast sections thicker than ½-in. Ammonium and magnesium silicofluoride as an inhibitor was most effective in reducing mold reaction. In quantities above 1 per cent in the mold mixture, the inhibitors were detrimental to surface finish of the castings.

All of the molds used contaminated the surface of titanium castings to some degree, Mr. Lang stated. Chemical analyses showed that even those castings made in machined graphite molds were contaminated to some extent by carbon and hydrogen. It was shown that the contaminated layer can be removed without loss of detail or adversely affecting the surface finish on castings by pickling in 50 per cent sulphuric acid containing 25 grams of ammonium bifluoride per liter of solution.

The concluding paper at this session, **Techniques for Producing Titanium Alloy Castings,** was co-authored by Marvin Glassenberg, assistant metallurgist, and M. J. Berger, research metallurgist, Armour Research Foundation, Chicago, and presented by the former. It described a furnace developed to permit the convenient melting and casting of titanium in an argon atmosphere. The metal is free from contamination. Mechanical operation of the furnace is simplified so that minimum supervisory effort and maintenance are required.

A zircon shell mold bonded with approximately 2½ per cent resin and coated with a graphite wash was found to produce good finishes and relatively sound castings. A dry sand mix has been developed which can be used for pouring cups and to make component parts in molds where shell molding is not practical because of circumstances involved.

A number of castings of industrial significance have been produced successfully, including gate-valve components, sealing rings for centrifugal pumps, globe valves and pipe tees. According to the authors, a titanium 1.2 per cent iron—0.8 per cent vanadium alloy has good fluidity and castability characteristics, and castings produced with this alloy are machinable.

PATTERNMAKING

TWO technical sessions and a roundtable luncheon comprised the program of the Pattern Division. Patterns for shell molding and investment casting were among the subjects treated.

Blow-in Driers was the first paper presented at the opening session. The speaker, R. W. Wendt, Industrial Pattern & Mfg. Co., Chicago, described a process in which aluminum driers of close dimensional tolerances are cast in a mold consisting of a green sand cope and cheek fitted over a permanent steel drag. The driers are annealed at 360° F for three hours to forestall growth during core baking service.

Casting in a permanent mold gives not only a smooth surface but also one that tends to resist wear in the core blowing operation. It also permits the economic production of almost an unlimited number of driers, unit cost of which depends on the number required.

Speaking on **Investment Casting by the Frozen Mercury Process,** Dr. I. R. Kramer, vice president, Mercast Corp., New York, reported that steel castings with a 42-in. diameter and weighing 300 pounds have been made by the Mercast process. Production of even larger castings is contemplated, he said.

The process, it was explained, consists of pouring mercury into a metal die, which is made in two or more sections; then the whole unit is submerged in a dry-ice, acetone bath at about −100° F which freezes the mercury. The frozen mercury assembly is removed from the bath "booked" to produce a single frozen mercury pattern, which is extracted from the die and dipped into a series of slurries to form a ceramic shell around it. At room temperature the mercury melts and is run out for subsequent reuse.

The thin shell mold is then fired at 1850° F for two hours; finally it is placed in a flask with back-up material, such as shot or coarse sand, and poured. The ceramic molds do not react with molten metals, and they also have the advantages of excellent surface finish, close tolerances in the casting, and the ability to produce thin-wall castings.

Two papers were presented at the second pattern session. The first was **Pattern Equipment for Shell Molding,** by O. C. Bueg, Arrow Pattern & Engineering Co., Erie, Pa. Mr. Bueg sees shell molding as an important development to patternmakers and feels that the process is utilizable for large castings and for non-production jobs.

He stressed the need for good finish in shell mold patterns, since finish is one of the process's prime advantages. Less draft than usual can be used in the patterns, and pushout pins should be incorporated in the pattern to guard against warping or breaking the shells. He prefers electrically heated patterns because of their uniform heating action, and he dwelt on the need for proper rods and thermostats. Constant temperature is vital.

During the discussion the speaker brought out that all materials used for shell mold patterns should be heat treated to prevent growth, especially for aluminum. Using types of aluminum and gray iron that have little growth characteristic is desirable. In response to a question as to whether cored threaded openings can be cast perpendicular to the parting line in shell molds, he replied that inserts with a dry sand core can be placed in shell molds. Session Chairman Vaughan C. Reid, City Pattern Foundry & Machine Co., Detroit, advised the use of the same metal for pattern and plate and discouraged the use of aluminum for shell mold patterns.

Concluding paper was **Use of Plastics in Patternmaking,** by W. C. H. Dunn, Western Pattern Works, Inc., Montreal, Que., Canada. Patternmakers should keep informed about new methods that will cut costs and help foundrymen, he stated. It was with this thought in mind that his com-

(Continued on page 148)

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(*Continued from page* 146)
pany investigated plastic patterns. Investigation revealed that they offer many advantages, not as substitutes, but as a new field.

Molds should be clean and sharp and made of low expansion plaster. Resin should be poured slowly to avoid air in the solution. Before baking, the plastic casting should be air dried four or five hours. Removal should be at room temperature.

Three types of plastics are available — thermosetting, thermoplastic and the new chemical setting. The epoxy resins seem to offer the best characteristics for plastic patternmaking, although the phenolic resins also are quite good.

Drawing qualities of plastics are good, and plastic can be threaded, tapped, nailed or otherwise handled without damage. Patterns made of it can be repaired easily and are identical with the master.

Discussion revealed that there is no size limit on plastic patterns.

Sessions on patternmaking concluded with a roundtable luncheon at which George Webber, Webber Gage Co., Cleveland, gave a brief talk on methods of measurement and their importance. He said that standard gages now are available which are accurate to one millionth of an inch.

Following the talk an open forum covering various phases of pattern and corebox manufacture was held. In patterns for production it was pointed out that fully machined patterns provide interchangeability and closer tolerances.

Other subjects considered were master pattern production, metal coreboxes, core driers, blow-in driers, shell molding equipment, wood patterns, etc. General consensus was that each has to stand on its own merits, and to provide the proper equipment the patternmaker should obtain all possible information relating to its use. From that he then can determine the most satisfactory type.

EDUCATION

EDUCATION Division of AFS sponsored a roundtable luncheon and two technical sessions during the convention. W. J. Hebard, Continental Foundry & Machine Co., East Chicago, Ind., and chairman of the division, presided at the luncheon, assisted by W. H. Ruten, Polytechnic Institute of Brooklyn, Brooklyn, N. Y.

Human Engineering was the title of a thought-provoking talk given at the luncheon by B. C. Yearley, National Malleable & Steel Castings Co., Cleveland. Mr. Yearley believes that the biggest problem facing the foundry industry today is the dwindling supply of men capable of becoming line supervisors. This situation, he said, is the result of the present age of specialization. Foundries principally are attracting men who can be taught only a specialist's job which permits them shortly to be earning as much as men with 15 years of experience.

Mr. Yearley declared that foundries are doing a good job of enrolling college men but relatively nothing to attract men from the lower educational levels. Moreover, there is little purpose in selling the high school student on the foundry industry if the only thing offered is a journeyman's job. The speaker maintained that foundries must provide the inducement of supervisory positions to these prospective employees and set up the necessary in-shop training programs to create supervisors of the most capable individuals.

At the next session **A Short Course in Foundry Skills** was the title of an interesting—and sometimes humorous — description by Arthur Agostini, Grede Foundries Inc., Milwaukee, of his experiences in training an unskilled force at a new foundry. The task was complicated by the fact that the force consisted of Puerto Ricans and displaced persons who spoke no English. In this instance, as well as in any other training program, Mr. Agostini said, the biggest problem was to induce the men to want to learn. This motivation can be helped by incentive pay.

The speaker also pointed out that the foreman holds the key in training work; if he is convinced the men under him cannot be trained, they won't be, regardless of the type of program followed.

The concluding session consisted of a panel discussion of the subject, **What Does the Foundry Industry Want AFS To Do in Educational Work on the Local Chapter Level?** Fred G. Sefing, International Nickel Co., New York, was moderator.

R. M. Reese, supervisor, Trade and Industrial Education, state of Ohio, Columbus, said that the industry must overcome the public's apathy toward work in foundries. Too many people, he said, are ignorant about foundry work, opportunities, wages and working conditions. The problem is intensified by the relatively small number of boys now entering the working ranks—a by-product of the depression.

Mr. Reese recommended that foundries work on an industry-wide basis to analyze its labor needs, provide training programs and opportunities for advancement, and institute an information program for school guidance counsellors and the public at large concerning the desirability of foundry employment.

Help Is Available

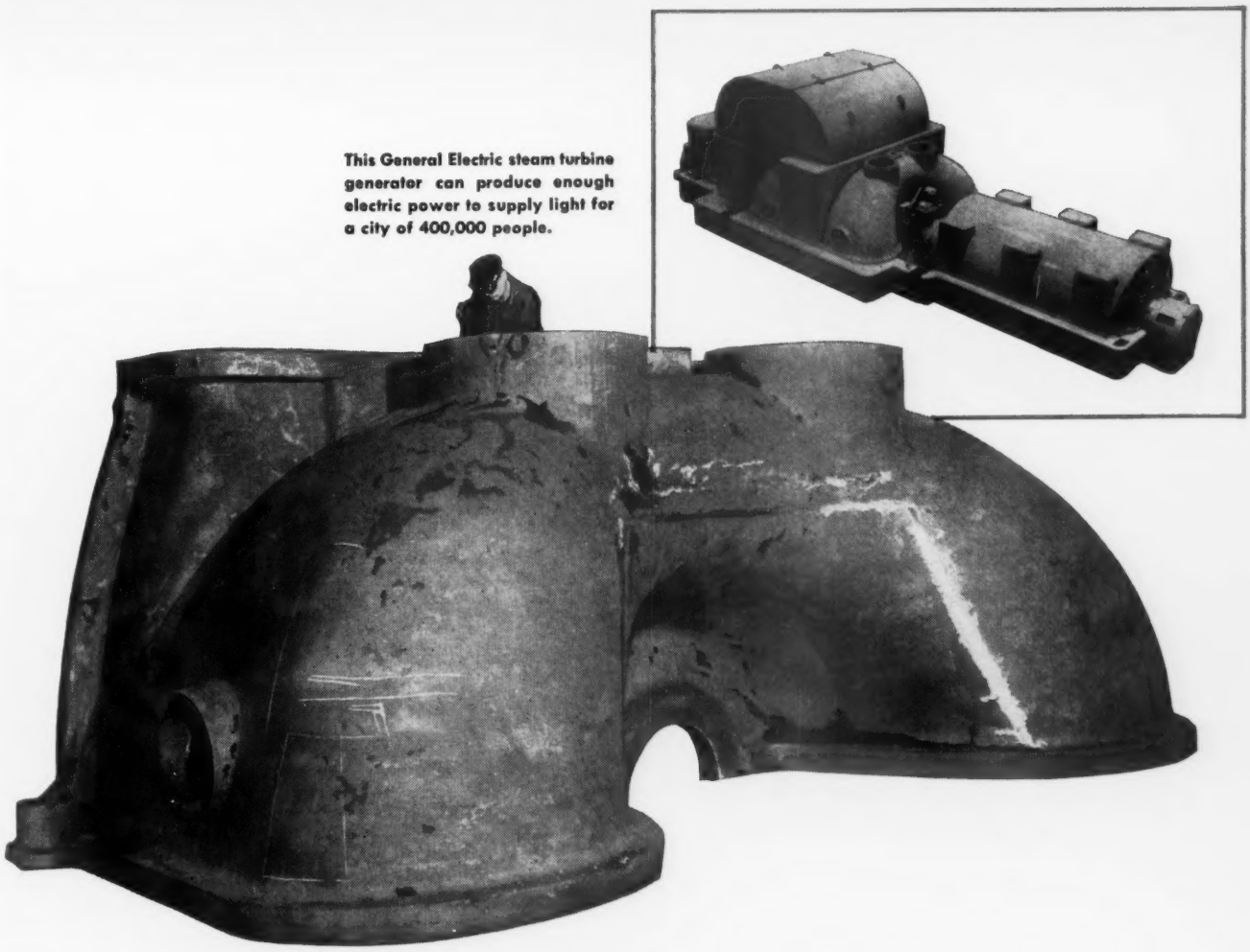
A. B. Sinnett, educational director of AFS, next described means available through society headquarters to assist chapters in their educational programs. He suggested a cast metals study course for secondary industrial arts and vocational schools, as well as a vocational guidance course. He believes such courses, ranging from two weeks to two months, would create interest in the industry among students and also bring it to the attention of their parents. These courses would not provide the industry with trained technicians, but Mr. Sinnett urged foundries to find jobs for high school graduates wishing to work in the industry.

As an aid to the schools who include a cast metals course in their curriculum, Mr. Sinnet proposed that AFS national headquarters be the central source of supply for teaching aids, literature and information for instructors.

He encouraged foundries to cooperate by inviting students to make fields trips through their plants, make technicians and supervisory personnel available for speaking assignments before classes. Chapters can aid by planning one meeting a year directed toward student guests from their area. He also suggested scholarships for advanced study be made available by chapters for worthy students.

B. C. Yearley, National Malleable & Steel Castings Co., Cleveland, followed, and he questioned how much the AFS national headquarters can accomplish by itself. The impetus

(*Continued on page* 150)



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REPUBLIC STEEL

(*Continued from page* 148)

for such a program, he believes, should come from the foundries.

The disappointing experience of the Philadelphia Chapter in trying to determine the needs of chapter members in developing the chapter's educational program was told by H. E. Mandel, Pennsylvania Foundry Supply & Sand Co. No clearly defined need was provided through answers to the questionnaires that were distributed.

Earl M. Strick, Erie Malleable Iron Co., Erie, Pa., reviewed the experience of Northwestern Pennsylvania Chapter of AFS in Erie in acquainting the public in that area on the foundry industry. Their first attempt to introduce a cast metals course in the local vocational school resulted in 27 boys signing up, but when the classes began, only two boys were present. The remainder had been forbidden by their parents to take up foundry work. It was this experience that stimulated the chapter into its public relations job.

Mr. Strick did say, however, that the most interest in foundries has been evidenced by boys who have visited the plants from the outlying sections of Erie. During these trips several invariably ask whether jobs are open in the plant after seeing the various operations.

During the discussion period, a foundryman from Canada suggested the establishment of classes on foundry subjects as part of an adult education program with local schools so that people already associated with the industry could improve themselves and prepare for better jobs. It was pointed out that schools are happy to co-operate in such programs but it is up to foundries to go to the schools for such classes to be arranged. Classes of this type have been a great success in the Central Michigan Chapter's area. Courses have covered sand control, cupola operation, metallurgy and even quality control.

INDUSTRIAL ENGINEERING

ABOUT 40 attended the first of two sessions sponsored by the Industrial Engineering Committee, which supersedes the former Time Study Committee of the AFS.

H. W. Bielefeld, in his paper, **Analysis of Work Content, Time, Distance and Speed at Conveyor Stations,** described a time-distance chart theory based on practical time study work done during the past year at Ford Motor Co. of Canada, Windsor, Ont., where he is manufacturing engineer in the foundry and heat treat plant. In explaining construction of the charts, presentation was directed towards a section only of work standards procedures and dealt with planning of work stations, methods study and estimate work on moving conveyors. Moving work station introduces speed, distance and position of work at a given time, so that the net result includes several interdependent variables.

Answer to this problem is a two-dimensional chart, with a time and correlated distance scale. This time-distance chart can be used as a basis for mathematical calculation, where more accuracy is desired and can be used for summarizing and as a work sheet in combination with standard data.

Discussion brought out that this was a new, radical approach and this method of attack was arrived at in order to determine type of equipment necessary in re-arranging the Ford-Canada foundry during an expansion program. It started with an engineering plan. Asked if the charts can be applied when there are no fixed distances, speaker stated they can, by dealing with flow of material, adding several work stations combined with a float between stations.

Educating Management to a Valuable Tool, the second paper, written by John Taylor, formerly of Lester B. Knight & Associates, Chicago, was presented by W. E. Stewart of that company, who discussed the paper and added his own comments. It is realized that time study and motion analysis are modern tools necessary for setting of incentive wages but few managements realize the vast area of functions which can be served with this basic information, properly utilized. Standard data sheets combined with job specification sheets (spec sheets) should be used on all productive operations in the foundry. In addition to methods analysis, setting standards and job specifications, standard data also definitely and specifically settle all grievances as to job content when an operator believes he has been instructed to do something not a regular part of his job. The data can be used for cost estimating purposes, accurately estimating prices on molding, coremaking and cleaning details.

Selling top management is the first step in full use of standard data, said the speaker. Business profits most when foremen and other key personnel are trained to know the real details of time study, motion analysis and basic principles involved in development and application of standard data. Method of setting up a training program was discussed In subsequent discussion, incentives as applied to jobbing machine shops were mentioned, as well as importance of reviewing standard cost data periodically to bring it up to date. Review of training programs after six months or a year was recommended.

At the second session E. D. Bolden, Westover Engineers, Milwaukee, outlined a method for establishing an **Incentive Plan for Line Supervisors.** Mr. Bolden defined an incentive as an opportunity for a supervisor to earn a worthwhile bonus based on his management and efficient operation of that part of the shop which is his responsibility.

In establishing a multi-factor incentive plan, Mr. Bolden suggested that factors be within the control of the supervisor and reasonably easy to measure. The factors should be grouped so one group reflects plant-wide performance as a means of encouraging plant-wide teamwork and the remaining factors reflect departmental performance. The speaker suggested the incentive pay be approximately 25 per cent of the base as an optimum, although not necessarily maximum achievement. He advised calculating the results and paying the bonus separately at least once a month, and also making available to all supervisors a progress report of their performance at least once a week.

The plan should be reasonably simple so results may be calculated with minimum expense. Guarantee the plan for a given period and revise factors at stated intervals only to meet changed conditions. Mr. Bolden believes any plan should be based on a measurement of a savings-sharing and should reflect meritorious effort of the supervisor. This type incentive ought to encourage

(*Continued on page* 152)

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(*Continued from page* 150)

steadying of production, elimination of waste, cost reduction, maintenance of quality, proper utilization of equipment and facilities, and service and assistance to employees.

Methods used to establish **A Measured Daywork Program** were described by L. W. Lehmann, John Deere Van Brunt Co., Horicon, Wis. Decision to establish daywork programs was made when it was found some workers were receiving maximum wage rates who were occupied only 60 per cent of an eight-hour day.

In setting up schedules for daywork, Mr. Lehmann urged going beyond time study to establish standards as the basis for work schedules. Mr. Lehmann discussed power and hand sweeping and janitor work. While sweeping manpower was not actually reduced, aisle sweeping has been increased 122 per cent and hand sweeping has been increased 74 per cent. Also, areas are cleaned at predetermined, regularly scheduled intervals so workmen co-operate by disposing of refuse immediately before the sweeper arrives, with a noticeable trend away from littering aisles throughout the day.

Encouraged by the success of scheduling the sweepers' operations, janitors' duties were next analyzed, standards applied and work scheduled. This program reduced the 11-man crew to 10 men but the increase in service was tremendous. When plant production was cut back, three additional men were removed and the frequency of certain cleaning operations reduced. Using standards proved of great assistance in establishing new work schedules.

Mr. Lehmann concluded with an analysis of the work performed by men supplying facing sand to molders in the foundry department. By assigning a number of molders for each sand wheeler to service and distributing the work load as evenly as possible, an 18-man crew was reduced to 13 men with no change in output.

MALLEABLE IRON

IN THREE technical sessions and one roundtable luncheon, malleable iron foundrymen examined some new and some old phases which provided considerable food for thought, and included such topics as plastic deformation, prebaking, furnace atmospheres, hot tearing, pearlite rims, annealing atmospheres, and melting controls.

In the opening session, W. K. Bock, National Malleable & Steel Castings Co., Cleveland, spoke on **The Effect of Plastic Deformation of Hard Iron on Subsequent Annealing,** which described results obtained in cold working white iron and then annealing. Using brinell impressions as the cold working means, it was found that graphitization increased. Dropping a heavy weight on a flat block of white iron showed the same effect as did tumbling specimens in a barrel for several hours. Possible application of the phenomenon is to those castings which are subject to pearlitic rims. Tumbling them in the white iron state to develop plastic deformation near the surface will eliminate the rim effect after annealing.

In the discussion attention was directed to the same effect being obtained earlier in experiments on forging and rolling white iron, but in those studies the temperatures at which the work was conducted also had an effect, since they were in the annealing range. In reply to a question as to the reason why plastic deformation increased graphitization, Mr. Bock said he believed it was due to increased nucleation formation.

Prebaking Effect in Malleablizing was the subject of a paper prepared by Floyd Brown, North Carolina State College, Raleigh, N. C., which, in the author's absence, was summarized by Frank Rote, Albion Malleable Iron Co., Albion, Mich. Work by the author with two malleable iron compositions indicated that maximum nucleation during annealing occurred when the material was given a prebake around 600° C (1112° F). However, when the specimens were previously soaked in a hydrogen atmosphere, the prebaking had no effect.

In the discussion, R. W. Heine, University of Wisconsin, Madison, Wis., pointed out that while it appeared that greatest nucleation was favored at the temperature indicated, a double treatment formed more nuclei than the single treatment. He stated that prebaking first at 500 to 600° F, followed by heating at 1100 to 1200° F, showed the highest number of nuclei.

W. D. McMillen, International Harvester Co., Chicago, stated that a number of years ago he found that a prebake at 700° C for seven hours gave greater nucleation but was ineffective if the iron had been over-oxidized in the furnace, and since the latter occurred spasmodically, prebaking practice was abandoned.

H. C. Stone, Belle City Malleable Iron Co., Racine, Wis., drew attention to the procedure of taking a longer period of time in bringing castings up to annealing temperature which, in a degree, involved prebaking. He said that the method gives a saving in over-all annealing time.

Milton Tilley, National Malleable & Steel Castings Co., Cleveland, stated that investigation by Dr. Harry A. Schwartz showed that extension of time in bringing to temperature cancelled out the over-all saving in annealing time, so the practice of slowly heating up was abandoned by his firm.

In the second session, **Some Effects of Melting Furnace Atmospheres on Tensile Properties and Annealability of Malleable Iron** was discussed by R. W. Heine and G. E. Kempka, both with University of Wisconsin. Prof. Heine described how a number of malleable iron compositions were melted under different atmospheres, including CO_2, N_2, air, and CO-CO_2 both dry and wet, and the effect of those gases on composition and mechanical properties.

Silicon losses do not occur during melting down unless free oxygen or water is present in the atmosphere, and the same condition exists under holding temperature. Decarburization occurs whenever CO_2, O_2 and H_2O are present. High nitrogen atmosphere increases yield and tensile strengths while severe impairment occurs in those properties when water vapor is present. Free oxygen in the atmosphere also impairs tensile strength.

Mr. Kempka discussed effect of atmosphere on annealing and indicated the high nitrogen causes the iron to be more resistant to mottling, and requires a longer time for first and second stage annealing. Shortest first-stage time occurs under 100 per cent CO atmosphere, and the same applies to second stage. Water vapor did not appear to affect either stage of annealing.

Strength of Some White Irons in the Range of Hot Tearing, by J. P. Frenck and R. W. Heine, both with University of Wisconsin, was presented by Prof. Heine. Dead weight testing of specimens showed that load applied and the temperature were more important than difference in composition. For example, a 10-lb

(*Concluded on page* 154)

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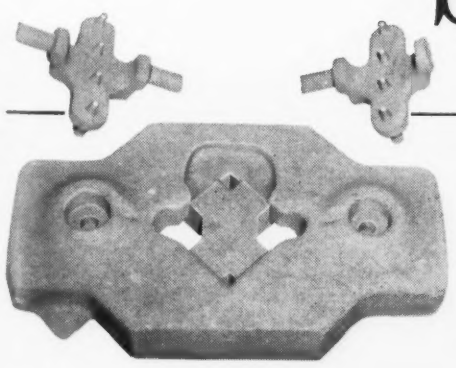

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(*Concluded from page* 152)

load at 2140° F resulted in fracture, which also occurred at 2063° F with an 81.5-lb load. Similar results were obtained with spring loading tests. However, Prof. Heine pointed out that data obtained should not be taken too literally since cooling rate in the mold—as well as mold materials, cores, restrictions to contraction, etc.—had a considerable effect on hot tearing.

Third malleable session included **Graphitization of Rims in Malleable Iron,** by H. A. Schwartz and J. D. Hedberg, National Malleable & Steel Castings Co., Cleveland, which was discussed by Mr. Hedberg. Examination of the composition and structure of the outer surface of specimens to a depth of about 0.10-in. indicates that the mechanism of graphitization is different and slower than that in the interior. First 0.02-in. layer graphitizes at a slower rate than those immediately beneath.

Effect of Atmospheres on the Rate of Anneal of Blackheart Malleable Iron, prepared and presented by J. E. Rehder, Canada Iron Foundries Ltd., Montreal, constituted a review of literature on the subject relating to both laboratory and plant practice studies. From the laboratory phase, results indicate that annealing in a vacuum provides the most rapid graphitization; high nitrogen atmosphere increases the time as much as 50 per cent; oxygen has no effect on anneal, but of course oxidizes the iron; hydrogen causes trouble due to carbide stabilization, and as much as 10 per cent has a decided effect in slowing anneal; air appears to have no effect except that presence of nitrogen makes the conclusion somewhat doubtful, and the combination CO-CO_2 atmosphere has no effect on anneal.

In plant or commercial practice the usual CO-CO_2 atmosphere may range from ratios of 1:1.9 to 8.0 with apparently satisfactory results. In summation, Mr. Rehder said that as far as commercial practice is concerned it appears that any annealing atmosphere which does not scale the iron, does not contain any hydrogen and is reasonably low in nitrogen, will serve satisfactorily.

At the malleable roundtable luncheon, E. T. Price, Cadillac Malleable Iron Co., Cadillac, Mich., and L. E. Emery, Marion Malleable Iron Works, Marion, Ind., were speakers. Mr. Price described the application of air recuperators in air furnace operation and said they provided savings in fuel, greater melting speed and more complete combustion near the burners. He indicated that present figures indicate a ratio of powdered coal to iron of 1:3.88, including delays and other operating factors. Repair and maintenance of the recuperator runs about 14 cents a ton of iron. Temperature of the air from the recuperator is 700° F.

In the discussion, J. E. Rehder suggested use of recuperators for heating the cupola blast instead of furnace air, and the possibility of using lower grade coal. Carl Joseph, Central Foundry Division, Saginaw, Mich., said that he used natural gas for cupola blast heating, and the cost of heating was about 8 cents per ton of iron.

Mr. Emery described the numerous controls followed in obtaining iron to meet the 35018 grade specification. This begins with analyses of raw materials and follows through the melting procedure. Cupola dimensions are checked after repair to see that they are correct, and the same is done with the air furnace. Mr. Emery stated that proper cupola operation, with careful attention to charge compositions, slag control, etc., is essential in obtaining the desired quality of iron at the furnace taphole—the air furnace acting merely as a holding unit.

In operation of the air furnace, he said he had found that use of an instrument for analyzing the furnace atmosphere helps efficiency since it reduces fuel consumption and increases sidewall life. At present he indicated an over-all fuel consumption of 175 lb per ton of iron, including that for preheating the furnace. Coal used contained 23 per cent volatile matter.

REFRACTORIES

AT a meeting sponsored by the Refractories Committee, J. H. Rickey Jr., Ironton Fire Brick Co., Ironton, O., discussed **Economic Considerations in Refractory Ladle Practice.** Cost of refractory linings, cost of installation, length of service obtained, and effect of refractory linings on metal being poured, should be taken into consideration when analyzing ladle refractory practice.

The speaker first discussed forehearths, mixing ladles, holding or desulphurizing ladles, illustrating his remarks with slides. Mortars for laying up super-duty and dense high-duty fire clay brick, used with success in these types of ladles, were described. Air-setting high-temperature cement has an advantage over plastic fire clay and clay mortar. Cement has low shrinkage qualities, and no cracks are formed into which metal can run.

Slides illustrated step-by-step building of wooden forms used in ramming, and ramming operations were described. Large bull ladles can be lined successfully with plastic refractories, using those that do not build up with slag nor react to form more slag. Small pouring ladles are often relined after every heat with cheap clay. Speaker said higher quality refractory lining might pay off in better quality castings and less scrap. Illustrations were shown of ladle pouring brick, ladle bottom tile and dryers, and ladle covers were described and shown.

Discussion following the talk stressed importance of thoroughly drying monolithic linings and preheating of ladle to red heat before applying wash coatings so that moisture is not sealed in the lining. Discussion also concerned rods in ladle lids. If welded across the lid, expansion may cause cracking of refractory itself. Back-up material such as asbestos was suggested to overcome heat loss in using plastic refractories as linings.

Fred W. Jacobs, Texas Foundries Inc., Lufkin, Tex., presented the second paper, **Correlation of Air Furnace Bottom Temperature to Refractory and Operating Practice in a Cupola-Air Furnace Duplex System—Part II**—which was a continuation of a practical study of variables affecting refractory bottom life in an oil-fired air furnace as related to bottom temperatures. With E. C. Ashley, also of Texas Foundries, Mr. Jacobs engaged in a 15-month experiment with reference to a previous 10-month period of regular production practice, using the air furnace of a cupola-air furnace duplex system. Results indicate that measurement of bottom temperature continues to be a definite aid in predicting bottom life. Results of experimental slag treatment offer many observations that should be useful to operators of all types of air furnaces.

Questioning following presentation of the paper suggested the use of two furnaces. Mr. Jacobs said they only had one furnace but alternating two furnaces a week would be beneficial.

(Reports on other technical discussions at the Cleveland convention will be presented next month.)

Casting Institute Names Technical Consultant

The Investment Casting Institute recently named Dr. Nicholas J. Grant, associate professor of metallurgy at Massachusetts Institute of Technology, to act as technical consultant for the institute. Dr. Grant has published many papers in the field of physical chemistry of steelmaking and general high temperature metallurgy. He has published several papers on precision casting and has used this method as a research tool throughout his high-temperature metallurgical research. He has been engaged in precision casting research at MIT since 1940.

DR. N. J. GRANT

Dr. Grant studied metallurgy at Carnegie Institute of Technology where he graduated in 1938. Following graduation he joined the Bethlehem Steel Co. as an open hearth metallurgist. In October, 1940, he entered MIT to study for a doctorate, which he received in 1944. He became an assistant professor in 1944 and is now an associate professor working both in physical chemistry of steelmaking and high temperature of metals.

University of Illinois Is Given Equipment

A 2½-ton shakeout has been donated by the Caterpillar Tractor Co. to the University of Illinois' Department of Mechanical Engineering to permit mechanical removal of sand in foundry practices being taught at the university. The contribution marks the second foundry gift Caterpillar has made to the university. Previous donation was a used sand mixer.

ASTM Plans Busy Week For Annual Meeting

American Society for Testing Materials has arranged a full program for its annual meeting which will be held in Chicago on June 14-18. Most of the technical sessions will take place at the Sherman Hotel, which also will house the exhibit of testing apparatus and laboratory supplies, and the photographic exhibit. Some of the technical sessions and many of the 600 committee meetings are scheduled at the Morrison Hotel.

Feature of the technical sessions will be six symposiums including those on cyclic effect of heating and stressing on metals, coal sampling, odor, building constructions, electrical insulating materials, and permeability of soils. The President's luncheon will be held on Tuesday noon, June 15, which will provide the occasion for the president's address and presentation of various recognitions and awards.

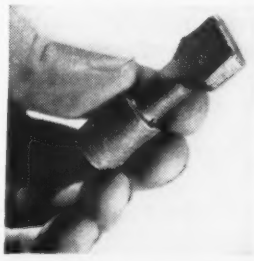
Gillett lecture will be held Tuesday afternoon, and R. L. Templin, Aluminum Co. of America, New Kensington, Pa., will speak on "Fatigue Properties of Aluminum." Marburg lecture will be presented Wednesday afternoon, June 16, by Howard F. Dodge, Bell Telephone Laboratories, New York; his topic will be "Interpretation of Scientific and Engineering Data." The annual ASTM dinner, to be held Wednesday night, will include entertainment and dancing.

Pouring a 6800 pound, 24" round beryllium copper billet which will be scalped, then forged into welding wheels 46" to 56" in diameter and 1" to 4" thick.

How a Philadelphia foundry successfully handles beryllium copper

Here at Philadelphia Bronze and Brass Corp., pouring 6800 pounds of high conductivity Berylco beryllium copper is an everyday affair. Castings are not only huge for beryllium copper but sound, without pipes, shrink holes or gas holes. Big billets are turned and forged for such products as resistance welding wheels. Small parts like switchgear and welding tips are regularly produced for such customers as I-T-E Circuit Breaker and P. R. Mallory. High conductivity and high strength alloys are alike in the relatively low pouring temperature required and their unexcelled fluidity while molten. High strength alloys can be machined in the soft or annealed condition, then heat treated for maximum properties, while high conductivity alloys are readily machined in the fully heat-treated condition.

From large to small. A welding tip sand cast in Berylco beryllium copper by Philadelphia Bronze and Brass.



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AROUND THE COUNTRY

NEWS REPORTS FROM

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Philadelphia . . .

DISTRICT gray iron jobbing shops are barely holding their own, if that. They are operating four to five days a week, but with somewhat reduced working forces and backlogs averaging around two weeks. Unless something unforeseen arises, they look for a continued spotty situation over the next few months, especially during the summer vacation period.

The Fourth of July week will see many foundries closed for vacations, as is usually the case; however, various shops will be down at other times for vacations during the summer months, and this will be true, importantly, of a number of casting consuming plants.

An exception, in point of activity, are pipe foundries, especially the pressure pipe shops, which are operating five days a week, double shift. This reflects seasonal building activity and the expectation is that high operating rates will continue throughout the greater part of the summer.

Steel foundries are operating five days a week, but with a fewer number of heats than a couple of months or so ago. Backlogs range from six to eight weeks, but six weeks is nearer to it for most foundries. Malleable shops also are operating around five days and in the case of some foundries specializing in fittings, double shifts are being maintained at present. Business is fair in the lighter consumer durable goods, and agricultural equipment demands have been seasonally active up until now. Automotive requirements, never particularly heavy in this area, nevertheless reflect in certain degree the moderately brisk activity of that industry. Malleable needs for the railroads remain dull.

Operations at brass and bronze shops are spotty, with maritime work very light. Most jobbing shops are operating four to five days a week. Light metal foundries are maintaining good schedules, but report a further shrinkage in backlogs. Aircraft work, the major source of support, is on the downtrend.

New York . . .

SLUGGISHNESS still prevails and some foundrymen now see little chance of improvement before fall, at the earliest. Actually, they believe the trend over the next two or three months will be on the down side, especially with the summer vacation season approaching. Not only will the foundries themselves be down for at least a week or longer for mass vacations, but their customers will in many cases be doing likewise. Peak of the vacation season is expected in early July, although vacation influences and warm weather will be reflected in varying degree right up to Labor Day.

Gray iron foundries are operating at about three to four days a week and with backlogs of not more than two weeks. Steel foundries are working five days a week with limited forces. Their backlogs average around six weeks, although most can make deliveries more promptly if necessary.

Bronze and brass jobbing shops are operating at around 75 per cent of normal, which is at least comparable with the steel foundries and definitely better than the gray iron shops. Most captive shops, except those engaged in maritime work, appear to be doing better than 75 per cent. This applies particularly to foundries working on meters, valves and pumps.

Aluminum and magnesium plants are maintaining a good rate of operation, but backlogs are shrinking.

Washington . . .

The survey of training practices in the foundry industry by the Labor Department's Bureau of Apprenticeship has been extended to July 1.

Reports on training activities in almost 2000 foundries have already been received. More returns have been received from Ohio than any other state, with Pennsylvania a close second. The top seven states in the returns thus far are: Ohio 384, Pennsylvania 367, Massachusetts 211, Illinois 119, Connecticut 108, New York 99, New Jersey 91.

Extension of the survey beyond the original Apr. 30 deadline will enable Bureau field representatives to visit additional foundries, as well as return to foundries that requested technical assistance in regard to training programs.

Despite the recent decline in foundry employment in some parts of the country, reports received from Bureau of Apprenticeship field representatives indicate that the industry is very much interested in training. It is evident that the long-run needs of the industry for skilled manpower require that a considerable number of workers be in training at all times.

The objective of the survey is to obtain information about the need for training and what progress is being made.

A comprehensive report on training activities in the foundry industry will be prepared at the conclusion of the survey.

Chicago . . .

CHICAGO Foundrymen's Association and the AFL International Molders and Foundry Workers Union, early in May reached an agreement on a contract for the coming year. The new contract provides for an increase in pay of 5 cents an hour. This boosts the hourly rate for molders and coremakers to $2.17. For a time prior to the agreement, a strike loomed as a threat.

* * *

Foundries in this area continue to operate on a spotty basis. Less than a 40-hour week is more common than a full week—three and four days being found frequently. Inventories of pig iron and coke are being held to a minimum and new supplies are ordered as requirements increase with releases for castings. Since May failed to bring a bulge in new business, and since the summer months normally dip in activity, prospects for upturn before September are dim. Of the district's 43 blast furnaces, only 29 are running.

* * *

Western Foundry Co., with plants in Chicago and Holland, Mich., has been acquired by Ebaloy Inc., Rockford, Ill. The transaction was consummated on Apr. 19, with the latter acquiring most of the outstanding stock of Western.

Last heats at the Chicago foundry, which produced both gray iron and steel castings, were poured on Apr. 30 and the facilities there will be liquidated. Gray iron business was transferred to the Holland plant which will continue to operate as the Western Foundry Co., a subsid-

(Concluded on page 159)

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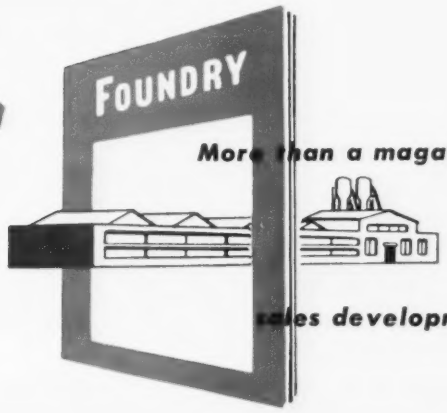

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for the Midwest Foundry Company

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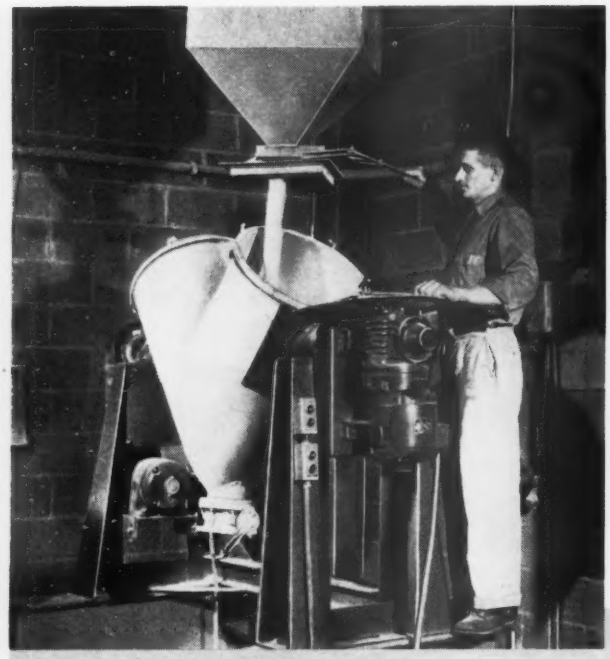
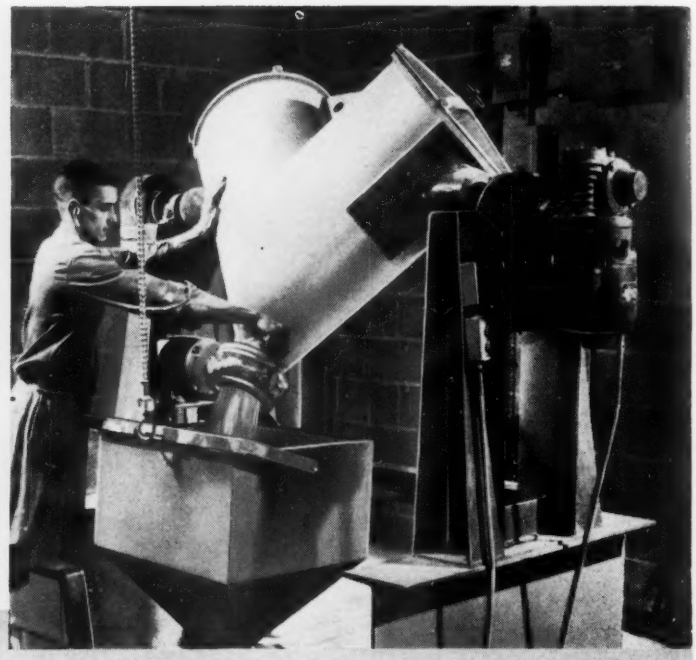
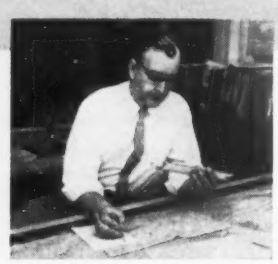


Feeding fine-grain silica sand and phenol-formaldehyde resin through one of the large access openings in the p-k twin shell blender.



Thoroughly blended shell-mold material is discharged into hopper before going to the shell molding machine. An electric hoist allows use of the same hopper for feeding material to the blender.

* Patented



Albert H. Doerr, chief engineer, Midwest Foundry Company, Coldwater, Michigan.

At Midwest Foundry Company (Coldwater, Mich.) the mixing of shell molding compound in a 5-cubic foot p-k twin shell blender actually *halves* the mixing time required by conventional mullers. This is the conclusion of Mr. Albert H. Doerr the Company's chief engineer.

The shell molding machine operator handles the p-k blender without interrupting his other duties and dustless precision blending takes only six to eight minutes for a 425 pound load. In this brief time, Mr. Doerr reports, the blender, equipped with the exclusive p-k intensifier bar* produces ". . . an even blend without resin segregation."

The easily removable intensifier bar rotates at high speed (2200 fpm) on the axis of the blender, creating a zone of intense activity into which blender action constantly feeds fresh material. The absence of baffles or obstructions of any kind permits complete, rapid discharge, and easy cleaning.

Because of the fast, efficient mixing afforded by this combination of tumbling and intensifier action, the p-k twin shell blender is widely recommended for use in the shell molding process. The right blender for your foundry is included in the full range of standard sizes—capacities from 4 quarts to 250 cubic feet.

Write today for Shell Molding Process Bulletin 404.

the ***Patterson-Kelley Co.,*** inc.

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101 Park Avenue, New York 17 • Railway Exchange Building, Chicago 4 • 1700 Walnut Street, Philadelphia 3 • 96-A Huntington Avenue, Boston 16 • and other principal cities

(*Concluded from page* 156)

iary of Ebaloy Inc. Steel castings business was transferred to Ebaloy's Crucible Steel Casting Corp. division in Milwaukee.

Western Foundry Co. was formed in 1892 to produce gray iron castings. It entered the steel castings field in 1941. Both activities had been engaged in since. Melting equipment included two cupolas and one electric furnace.

Los Angeles . . .

THE upward spiral of foundry activity, first evidenced in March, continued in April. Activity for most steel foundries in April was generally 25 per cent higher than in March. First quarter order volume for these foundries was 15-20 per cent higher than for the like period in 1953.

Increasing customer activity and a higher volume of inquiries gives confidence, say trade experts, that the high level of foundry activity will continue. A leading manufacturer of regulators, a large consumer of castings, says his business volume is greater than at any time during the last six months. Other casting users are increasingly confident that their consumption of castings will be sustained. Foundry backlogs have almost doubled; from two weeks in February-March to five-seven weeks currently. One foundry's backlog is nine weeks on some orders.

With the increase in activity, most foundries are operating on a full 40-hour work week for the first time this year. In February and March even the most active foundries dropped several Fridays from their schedules. Now even light casting producers, down to three days in March, are working full time.

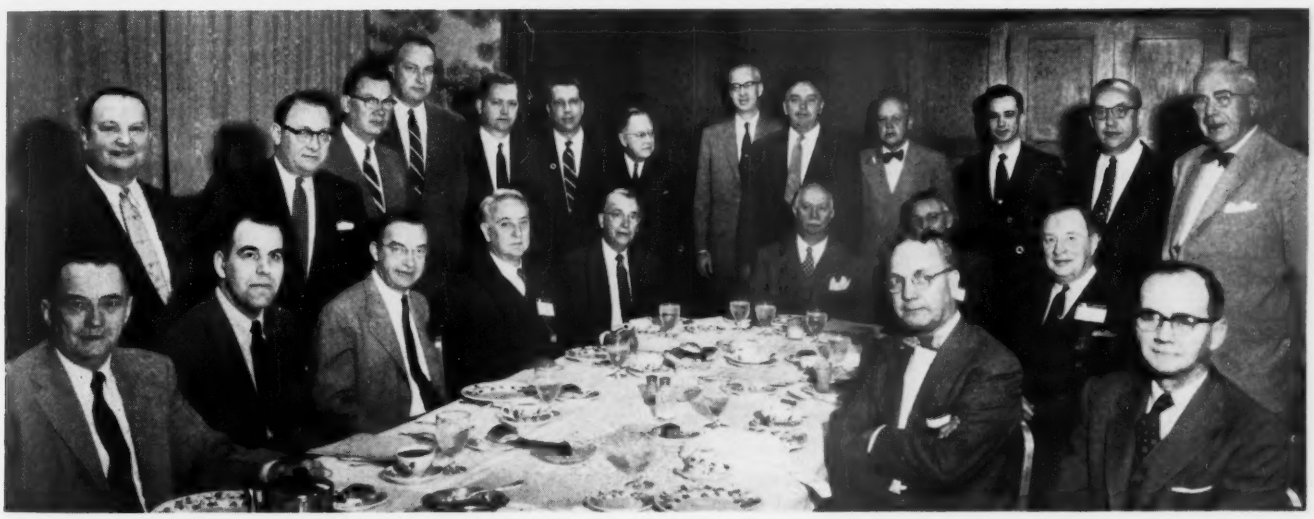
Foundry melting rates continue to increase. Most steel foundries are operating between 80 and 85 per cent of capacity, a slight rise over March and a substantial gain over January-February rates.

Foundry scrap purchases are steady at $40 per gross ton for No. 1 cupola and $44 for machinery castings. Operators are using care to limit build-up of scrap inventories, preferring to purchase for current needs. Increased purchases of steel rail are noted. One foundry completed a large purchase of eastern pig iron to overcome local shortages. Despite brighter prospects, dark spots still remain in the foundry picture. Pump manufacturing, a large market for castings, is depressed by failure of the usual April seasonal peaks to occur. Pump manufacturers are cautiously hopeful that agricultural seasonal influences are merely postponed; others say the slump will continue.

Appointed Distributor

Williston & Co., Delta, O., has been appointed national sales distributor of ceramic strainer cores and other foundry ceramic products for Industrial Ceramic Products Inc., Columbus, O.

NATIONAL CASTINGS COUNCIL HOLDS ANNUAL MEETING IN CLEVELAND



Officers and representatives of the National Castings Council. Seated left to right: James W. Wolfe, NFFS; Robert Langsenkamp, NFFS; H. A. White, NFFS; Dr. James T. MacKenzie, FEF vice president; Frank G. Steinebach, secretary; Henry J. Trenkamp, GIFS president; Frank J. Dost, AFS; H. A. Forsberg, SFSA; Collins L. Carter, AFS; W. Summerfield Brunk, NFA. Standing left to right: G. Dixon Shrum, FFMA; Ed King, FFMA; F. Kermit Donaldson, SFSA; Lowell D. Ryan, MFS; Donald H. Workman, GIFS; Edward J. Walsh, FEF; William B. Wallis, FEMA; Thomas Kaveny Jr., FEF; W. O. Larson, GIFS; W. W. C. Ball, NFA; A. J. Tuscany Jr., FEMA; A. J. McDonald, SFSA; D. V. Walker, MFS

ANNUAL meeting of the National Castings Council was held in Cleveland, May 12. Representatives of all the following member societies and associations were in attendance: Alloy Casting Institute, American Foundrymen's Society, Foundry Educational Foundation, Foundry Equipment Manufacturers Association, Foundry Facing Manufacturers Association, Gray Iron Founders' Society, Malleable Founders' Society, National Foundry Association, Nonferrous Founders' Society, Steel Founders' Society of America. Staff executives also were in attendance. Henry J. Trenkamp, president of the council, presided.

Election of officers resulted in the following: President, Thomas Kaveny Jr., Herman Pneumatic Machine Co., Pittsburgh, and president, Foundry Educational Foundation; vice president, G. A. Baker, Duriron Co., Dayton, O., and president of the Alloy Casting Institute; treasurer, F. Ray Fleig, Smith Facing & Supply Co., Cleveland; secretary, Frank G. Steinebach, FOUNDRY.

Representatives discussed the need for adequate foundry representation at Washington, the organization of a joint committee to further the training of supervisory personnel in the industry, the study of organizational activities, and other problems.

FOUNDRY DEVELOPMENTS

By EDWIN BREMER

Metallurgical Editor

RECENT information indicates that Ford Motor Co., experimentally is using resin-impregnated mahogany veneer laminated into board for patterns to produce shell molds for castings. Material known as "impreg" in addition to being resistant to effect of moisture also possesses resistance to high temperatures.

* * *

RECENTLY an eastern foundry producing a 5-lb red brass casting which had to be pressure tight suddenly encountered many leakers. Investigation disclosed that a nickel addition formerly included in the base mix had been left out. Reinstatement of the nickel addition (1 per cent) eliminated the leaker trouble without necessity of changing the gating and risering system.

* * *

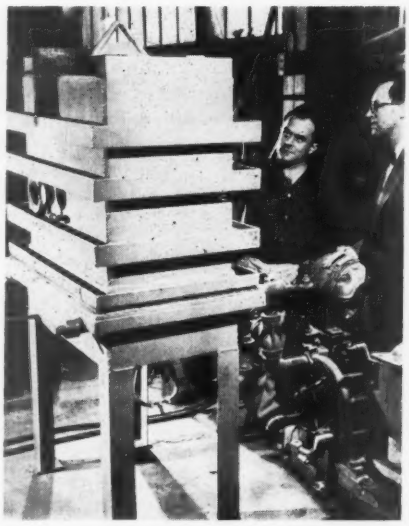
LOCATION of ejector pins on shell molding patterns is important since, if not placed properly, difficulty may be encountered with warped or distorted shells. Pins should have a clearance of 0.008 to 0.015-in. so that they move freely in the holes through the plate. They also should be of equal length so that they raise the shell uniformly from the pattern face. Placing the hot shell face down on a flat surface for about 30 seconds immediately after release from the pattern will aid materially in obtaining a flat surface.

* * *

METHOD of preparing coke breeze so that it will be suitable as fuel for the cupola or other melting processes is described in U. S. Patent No. 2,665,977 granted to William A. Englehart, deceased. It comprises thoroughly mixing 1 cu yd coke breeze, 1.1 to 2 cu ft portland cement and 8 to 16 gal water. Mixture is placed in open-top molds, vibrated for 10 to 15 seconds. Green brick is removed from the mold, allowed to air set for 2 to 3 hr, and then gradually subjected to steam pressure up to 90 to 110 psi. Brick is held at high pressure for 4 hr, and then pressure is reduced to atmospheric in about ½-hr.

* * *

ACCOMPANYING illustration shows a newly designed furnace developed by Howard Foundry Co. in its Milwaukee division for making castings from titanium. As is well known, titanium in the molten state tends to absorb numerous gases and react with most of the refractory materials commonly employed as molding mediums, and considerable work has been done to develop satisfactory conditions for casting the metal. Melting titanium under a vacuum or in the presence of an inert gas such as argon has solved the problem of contamination from the standpoint of gas absorption, but development of a suitable, expendable mold material is something else. Howard Foundry claims that it has



developed special materials for that purpose, but is mum on the details. However, attention is directed to recent work at Battelle Memorial Institute which indicates that dense, granular graphite free from fines and bonded with phenol resin gives good results. (Photo courtesy *Milwaukee Journal*)

* * *

STUDY of "Influence of Casting Temperature on Chill and Mottle Formation" by W. J. Williams, and reported in the February issue of the *Journal of Research and Development* (Birmingham, England), indicates that with normal manganese and sulphur contents cast iron heated above 1440°C shows a decrease in chill with decreasing pouring temperatures. Metal melted at 1340°C gives a chilling response that is not influenced by pouring temperature. Small additions of aluminum appear to accentuate the effect of casting temperature.

Influence of casting temperature is predictable in irons containing more than 0.3 per cent Mn and more than 0.05 per cent S, but on very low sulphur irons results are very erratic. Practical significance is that for production of castings with constant chill depth, it might be advantageous to maintain the melting temperature as low as possible so that uncontrollable variations in pouring temperature will have little effect.

* * *

ANALYTICAL process which shows promise of being rapid enough and accurate enough to study hydrogen content during steelmaking has been installed in the U. S Steel Research & Development Laboratory, Pittsburgh. Method is a modification of the vacuum-tin-fusion procedure so that gases evolved from the steel sample can be analyzed for hydrogen by means of a thermal conductivity cell, and depends upon the fact that in a mixture of hydrogen, nitrogen and carbon dioxide, the thermal conductivities of nitrogen and carbon dioxide practically are equal, and that of hydrogen is approximately seven times that of the other two.

Apparatus for the determination of hydrogen shown in the accompanying illustration consists of a closed system of glass tubes with mercury cut-offs, an induction furnace, two mercury diffusion pumps, a McLeod gage, a conductivity cell and a ½-hp mechanical vacuum pump to extract air from the system. Measurements of conductivity are dependent

on a precision ammeter with a range of 0 to 1.00 amp.

* * *

ACCORDING to U. S. Patent No. 2,666,001 granted to William A. Marshall, sand or other siliceous particles adhering to castings can be removed by immersion in an aqueous solution of a fluophosphoric acid.

CRUCIBLE FURNACES melt all the metal

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Seven forced draft coke fired Crucible furnaces. No. 225 and No. 300 Crucibles are used according to quantity of metal desired.

THE PHILADELPHIA BRONZE AND BRASS CORPORATION

PRODUCER of non-ferrous castings, maintains uniform quality and meets specifications by using only Crucible melted metals.

MELTING EQUIPMENT consists of seven .stationary coke fired furnaces (illustrated) each of 900 pounds capacity; three tilting Crucible furnaces (illustrated) oil fired, each 1200 pounds capacity and four stationary oil fired furnaces (not illustrated) 450 pounds capacity each.

CRUCIBLE FURNACES here, as in some 3000 other non-ferrous foundries in the United States, demonstrate their superiority in economy, flexibility and adaptability in the production of sound castings with minimum rejections.

Three tilting Crucible furnaces oil fired, using No. 430 long lipped Crucibles, 1200 pounds capacity each.

No. 300 Crucibles, 900 pounds capacity, are lifted from the stationary coke fired furnaces carried directly to the molds and poured.

THESE FIRMS CAN TAKE CARE OF ALL YOUR REQUIREMENTS FOR CRUCIBLE MELTING

CRUCIBLE MANUFACTURERS ASSOCIATION

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Joseph Dixon Crucible Co.

Lava Crucible-Refractories Co.

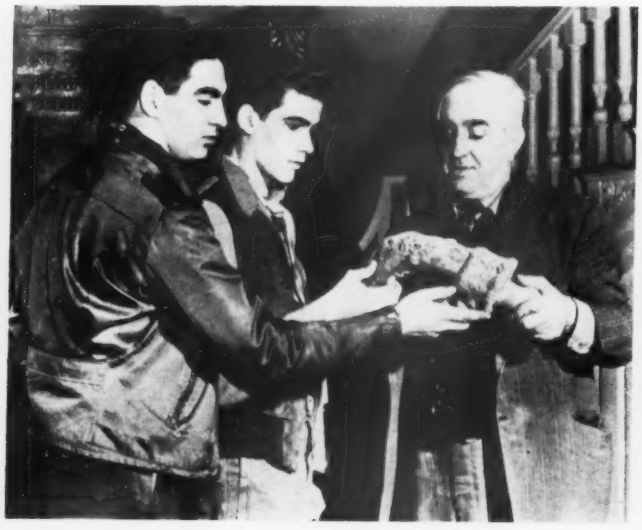
American Refractories & Crucible Corp.

Electro Refractories & Abrasives Corp.

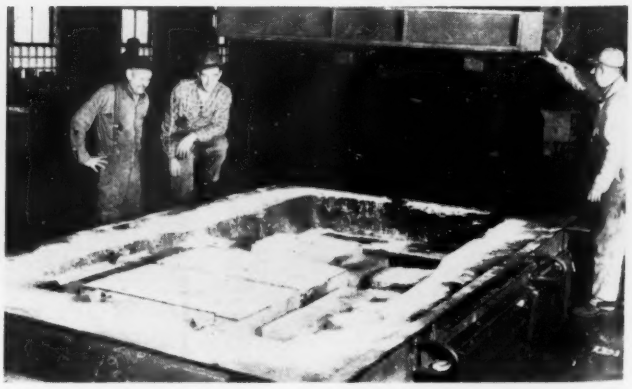
NEWS VIEWS

MATCH OF THE YEAR: The match book of the McGowan Co., Los Angeles, foundry equipment and metals supplier, has been selected as the best issued in the metal products field in 1953. It was chosen for its eye-catching simple design, with dark glossy cover simulating metal. United States Steel Corp., American Bridge Division, Pittsburgh; Phosphor Bronze Corp., Seymour, Conn.; Wheeling Machine Products Co., Wheeling, W. Va., and John A. Roebling's Sons Co., Trenton, N. J., also received awards.

70,000-LB CASTING: The unmachined casting on drop center freight car is ready for shipment to De Laval Steam Turbine Co., Trenton, N. J., for use on what are claimed to be the largest blast furnace blowers ever constructed. The 70,000-lb casting section, one of two, was made by the foundry division of Chambersburg Engineering Co., Chambersburg, Pa. The Chambersburg foundry specializes in cement bonded sand castings. Both cores and mold for this casting were of cement bonded sand.



PLUMBER'S FRIEND: During renovation of Independence Hall, Philadelphia, a 128-year-old pipe bend of a cast iron soil pipe system was found in perfect operating condition. Its discoverer, plumbing contractor William Sheppard, presents it to his son, William Sheppard Jr., center, and Edward Sims, plumbing students, who accept it on behalf of the Bok School, as a display to remind future plumbers of the long traditions of their craft.



LOWERING THE BOOM: Foundrymen of the Manistee Iron Works, Manistee, Mich., are seen lowering the upper part of the mold used for the 7-ton cast frame of a Michigan Tool Co. gear cutting machine. The casting is a part of the regular production of the Iron Works, now specializing in machine tool castings, both small and large, in iron and bronze. This frame size is 70 x 76 x 110 in.

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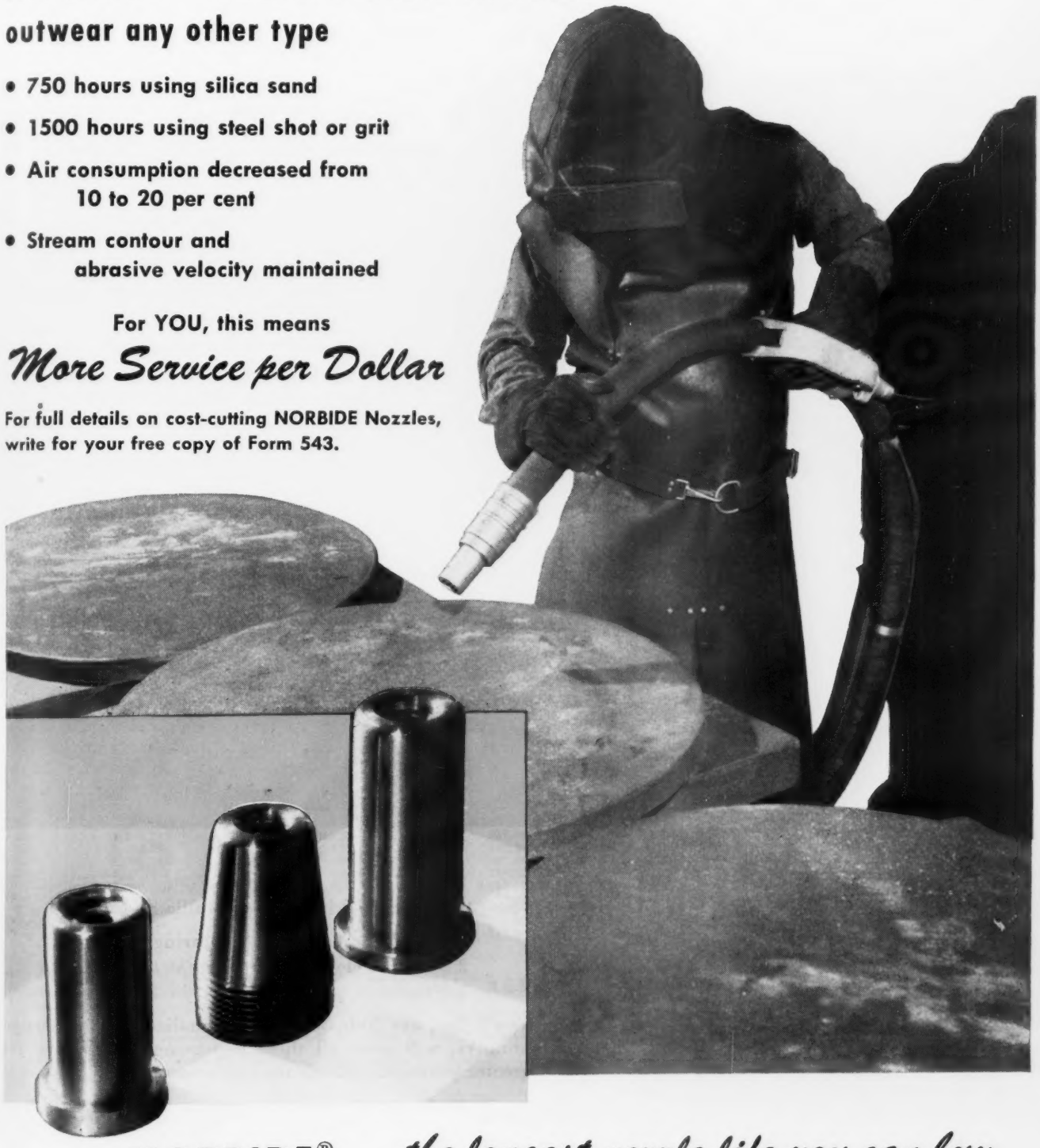

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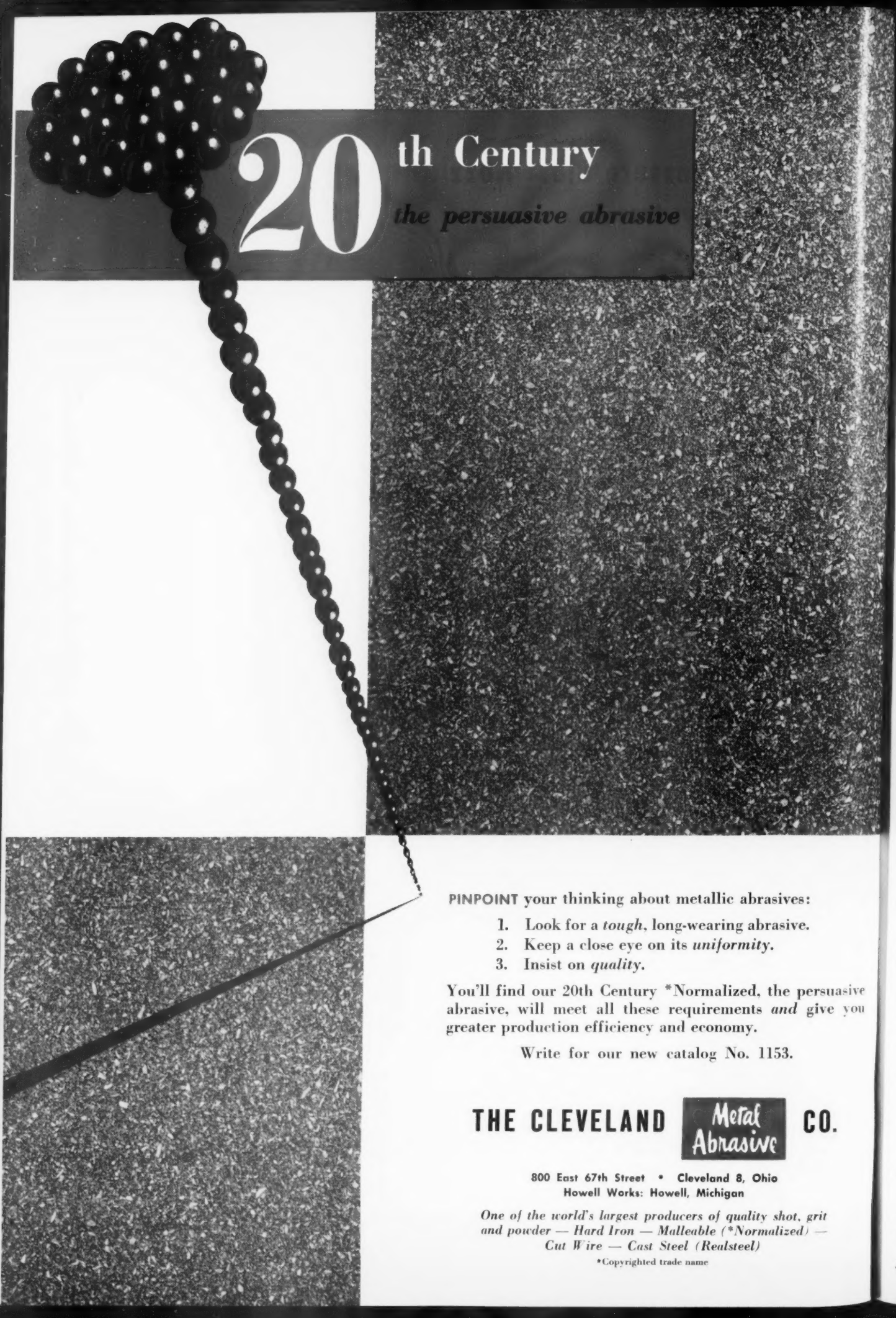

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*Copyrighted trade name

FOUNDRY STATISTICS

MALLEABLE IRON

(Shipments of castings—net tons[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1952	926,120	573,472	.....
1953			
Feb.	86,515	51,963	175,088
2 mo.	173,764	105,235	.....
Mar.	94,481	57,025	177,776
Apr.	95,923	57,757	174,514
May	82,050	48,011	160,387
June	86,514	50,819	151,016
July	77,111	45,413	137,251
Aug.	73,855	45,415	120,801
Sept.	74,333	45,466	114,523
Oct.	73,473	45,515	104,046
Nov.	63,435	37,500	93,156
Dec.	72,126	39,657	95,612
Total	967,065	577,813	.....
1954			
Jan.	70,288	38,266	85,565
Feb.	69,078	37,792	81,579
2 mo.	139,366	76,058	.....

COPPER-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—Sand	Shipments—Perm. Mold	Unfilled Orders[2]
1952[3]	1,009,910	910,862	63,865	....
1953[3]				
Feb.	85,183	76,847	5,061	76,578
2 mo.	170,964	153,533	10,449	.....
Mar.	92,798	82,639	5,716	69,490
Apr.	94,362	85,471	5,462	72,291
May	85,223	76,912	4,855	66,926
June	84,656	76,333	4,706	64,535
July	71,041	64,451	3,926	61,209
Aug.	78,357	70,557	4,890	63,419
Sept.	80,307	71,895	5,273	59,141
Oct.	83,661	74,221	5,775	53,867
Nov.	74,712	66,300	5,077	49,481
Dec.	77,669	68,814	5,082	47,922
Total	993,750	892,126	61,211	.....
1954				
Jan.	71,437	63,034	4,618	42,351
Feb.	68,849	60,913	4,743	41,943
2 mo.	140,286	123,947	9,361	....

ALUMINUM

(Shipments of castings—1000 pounds)

	Shipments—Total	Shipments—Sand	Shipments—Perm. Mold	Shipments—Die	Unfilled Orders[2]
1952[3]	518,979	194,616	146,883	169,732	.....
1953[3]					
Feb.	54,864	17,583	16,698	20,272	148,557
2 mo.	110,493	36,741	32,845	40,324	.....
Mar.	59,423	18,989	17,865	22,255	145,749
Apr.	61,582	20,009	18,583	22,620	141,231
May	57,602	19,600	16,479	21,208	138,037
June	56,820	19,330	15,535	21,675	136,437
July	51,653	16,664	15,733	18,915	126,426
Aug.	50,900	16,007	16,294	18,200	127,896
Sept.	53,694	17,818	17,215	18,245	122,049
Oct.	55,438	17,212	16,983	20,893	116,744
Nov.	51,405	16,209	15,349	19,409	108,698
Dec.	52,025	15,375	16,852	19,363	107,754
Total	661,035	213,954	199,733	243,107	.....
1954					
Jan.	51,446	14,698	16,615	19,709	103,318
Feb.	51,213	14,696	17,281	18,754	96,011
2 mo.	102,659	29,394	33,896	38,463	.....

MAGNESIUM

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1952[3]	34,857	32,977	.....
1953[3]			
Feb.	3,225	3,033	14,834
2 mo.	6,298	5,858	.....
Mar.	3,362	3,093	13,608
Apr.	3,294	3,046	12,709
May	2,679	2,434	13,635
June	3,136	2,666	13,664
July	2,372	2,084	13,840
Aug.	2,559	2,279	13,125
Sept.	2,524	2,236	12,454
Oct.	3,015	2,708	11,477
Nov.	2,677	2,413	10,619
Dec.	2,685	2,427	9,324
Total	34,601	31,244	.....
1954			
Jan.	2,451	2,149	8,800
Feb.	2,198	1,949	8,315
2 mo.	4,649	4,098	.....

PRODUCTION WORKERS

Estimated Number
(Thousands)

	Jan. 1954	Dec. 1953	Jan. 1953
Ferrous	190,700	194,400	225,700
Nonferrous	69,200	72,500	82,200
Average Weekly Earnings			
Gray Iron	$72.93	$74.40	$72.32
Malleable Iron	72.58	73.34	75.52
Steel	77.41	78.80	81.51
Nonferrous	80.20	81.61	82.41
Average Weekly Hours			
Gray Iron	39.0	40.0	40.4
Malleable Iron	38.0	38.6	40.6
Steel	38.9	39.6	41.8
Nonferrous	39.9	40.6	42.7

Labor Turnover Rate (Jan.)
(Per 100 employees)

	Total Accession	Total Separation	Quit	Layoff
Gray Iron	2.6	2.6	0.9	1.3
Malleable Iron	6.0	3.6	1.4	1.6
Steel	1.4	5.4	0.6	4.5
Nonferrous	2.6	7.1	1.1	5.4

Source: Bureau of Labor Statistics

GRAY IRON CASTINGS—SHIPMENTS

(Net tons[1])

	All Castings—Total	All Castings—For Sale	Miscellaneous Castings—Total	Miscellaneous Castings—For Sale	Heavy Steel Ingot Molds—Total	Heavy Steel Ingot Molds—For Sale	Chilled Railroad Car Wheels—Total	Pressure Pipe & Fittings—Total[4]	Soil Pipe & Fittings—Total[4]	Unfilled Orders[2]
1952	12,862,494	7,373,757	8,095,299	3,794,164	2,238,309	1,070,252	544,896	1,312,518	651,472	.....
1953										
Feb.	1,135,868	607,160	721,847	315,101	228,360	106,398	44,420	93,152	48,089	1,332,038
2 mo.	2,297,813	1,229,552	1,452,063	639,431	480,541	224,912	82,805	187,082	95,322	.....
Mar.	1,264,271	674,720	800,390	341,656	250,447	119,630	41,414	114,885	57,135	1,375,886
Apr.	1,277,288	683,047	799,872	329,802	246,873	122,702	44,877	120,105	65,561	1,305,849
May	1,185,545	641,581	734,326	312,836	238,202	115,728	41,373	113,136	58,508	1,271,711
June	1,196,106	648,400	743,737	312,681	232,596	115,946	45,542	114,118	60,113	1,245,904
July	1,056,422	573,280	652,371	274,890	212,187	106,526	36,715	97,739	57,410	1,232,651
Aug.	1,069,392	588,543	646,902	286,449	217,930	107,428	40,327	107,805	56,428	1,222,612
Sept.	1,105,582	611,905	669,225	289,909	232,055	117,694	37,055	108,270	58,977	1,170,191
Oct.	1,141,526	650,229	669,757	300,249	245,966	124,177	41,917	118,306	65,580	1,075,538
Nov.	1,004,326	563,930	589,657	266,039	227,800	111,022	31,373	101,576	53,920	977,012
Dec.	1,032,444	552,565	634,250	274,203	228,532	108,700	30,051	94,053	45,558	954,885
Total	13,630,715	7,417,752	8,392,550	3,537,645	2,813,129	1,374,465	473,449	1,277,075	674,512	.....
1954										
Jan.	932,298	488,497	607,755	261,164	154,359	60,947	31,316	90,898	47,970	871,918
Feb.	936,364	491,983	607,085	252,591	156,933	70,261	29,240	92,546	50,560	865,344
2 mo.	1,868,662	980,480	1,214,840	513,755	311,292	131,208	60,556	183,444	98,530	.....

STEEL CASTINGS—SHIPMENTS

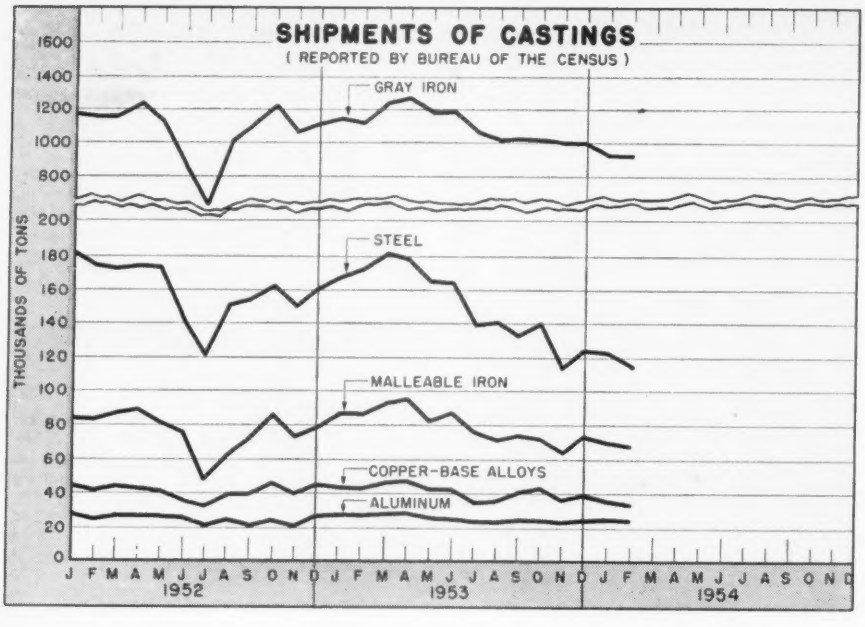
(Net tons[1])

	All Castings—Total	All Castings—For Sale	All Castings—Railway Specialties	Carbon Steel—Total	Carbon Steel—For Sale	Carbon Steel—Railway Specialties	Alloy Steel—Total	Alloy Steel—For Sale	Alloy Steel—Railway Specialties	Unfilled Orders[3]
1952	1,925,707	1,476,746	342,561	1,496,450	1,053,264	298,948	553,403	430,493	40,613	.....
1953										
Feb.	175,675	137,592	33,156	122,624	94,991	29,828	53,051	43,495	3,328	644,302
2 mo.	342,886	264,411	60,306	241,047	184,041	54,616	101,849	81,616	5,690	.....
Mar.	182,181	141,873	34,364	129,055	100,069	31,772	53,126	42,286	2,592	634,600
Apr.	179,615	140,051	34,035	128,457	99,602	31,212	51,158	40,938	2,823	573,565
May	165,649	126,380	29,552	117,318	88,781	26,888	48,331	38,036	2,664	328,931
June	164,665	125,984	30,381	116,358	88,260	27,767	48,307	38,130	2,614	475,756
July	139,577	105,687	22,925	95,891	71,488	20,938	43,686	34,532	1,987	467,900
Aug.	141,340	107,941	25,026	97,076	73,784	22,637	44,264	35,003	2,389	418,927
Sept.	135,303	102,880	24,108	95,944	72,780	21,724	39,359	30,338	2,384	327,172
Oct.	140,702	106,788	25,354	100,568	76,118	23,449	40,134	30,988	1,905	313,684
Nov.	114,088	84,945	17,784	79,989	57,947	16,233	34,099	27,167	1,551	308,526
Dec.	123,281	91,017	18,685	86,465	62,377	16,998	36,674	29,952	1,687	278,389
Total	1,829,287	1,397,957	322,520	1,288,168	975,247	294,234	540,977	428,986	28,286	.....
1954										
Jan.	122,758	93,577	20,197	83,927	62,749	18,407	38,831	30,828	1,790	251,847
Feb.	116,520	88,699	17,938	81,433	60,638	15,961	35,087	28,061	1,967	234,634
2 mo.	239,278	182,276	38,135	165,360	123,387	34,368	73,918	58,889	3,757	.....

[1] Source: Bureau of Census. [2] For sale only. [3] Based on new sampling method; not comparable to prior figures. [4] All cast iron pipe is shipped for sale.

(Concluded on page 166)

FOUNDRY STATISTICS (Concluded from page 165)



INDEX OF FOUNDRY EQUIPMENT ORDERS

Foundry Trades Only
(Net Orders Closed, New Equipment)

	1953	1954
Jan.	99.6	17[illegible].8
Feb.	97.5	[illegible]9.9
Mar.	132.2	[illegible]
Apr.	111.8	[illegible]
May	182.1	[illegible]
June	156.4	[illegible]
July	158.9	[illegible]
Aug.	235.5	[illegible]
Sept.	127.7	[illegible]
Oct.	87.1	[illegible]
Nov.	149.4	[illegible]
Dec.	160.8	[illegible]

Note: Figures are percentages of the base average). This is a new base period. Source: Foundry Equipment Manufacturers Association, period 1947-49 taken as 100 per cent (monthly

COKE PRODUCTION & CONSUMPTION

(Net tons)

	Production	Consumption Total	Consumption By Foundries
1952	68,254,109	67,865,639	3,102,446
1953			
Feb.	6,140,075	6,271,311	237,620
2 mo.	12,903,569	13,151,506	486,565
Mar.	6,842,488	6,880,579	275,442
Apr.	6,543,601	6,541,307	271,955
May	6,824,810	6,752,823	272,673
June	6,625,223	6,692,864	254,830
July	6,748,229	6,654,080	217,501
Aug.	6,719,941	6,587,005	236,738
Sept.	6,404,143	6,330,441	236,119
Oct.	6,554,638	6,555,613	236,329
Nov.	6,208,155	6,033,813	216,837
Dec.	6,033,009	6,041,383	210,388
Total	78,467,806	78,227,414	2,915,420
1954			
Jan.	5,812,426	5,639,117	224,298
Feb.	4,886,716	4,922,664	211,114
2 mo.	10,699,142	10,561,781	425,412

INGOT BRASS & BRONZE

(Shipments in net tons)

	1953	1954
Jan.	24,423	20,661
Feb.	25,429	19,920
Mar.	28,256	23,653
Apr.	25,044	.....
May	21,660	.....
June	20,818	.....
July	19,321	.....
Aug.	20,156	.....
Sept.	21,463	.....
Oct.	22,280	.....
Nov.	21,860	.....
Dec.	20,541	.....
Total for year	271,251	

ZINC-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments—Totals	Shipments—For Sale	Unfilled Orders[2]
1952[3]	408,353	282,673	.....
1953[3]			
Feb.	46,583	31,761	91,800
2 mo.	92,524	62,463	.....
Mar.	51,673	35,460	90,266
Apr.	51,456	34,674	91,874
May	44,471	29,403	85,234
June	49,051	31,255	88,060
Total	523,892	341,963	.....
1954			
Jan.	40,396	27,257	61,745
Feb.	37,660	24,112	55,351
2 mo.	78,056	51,369	.....

PIG IRON PRODUCTION AND CONSUMPTION

	Production** (Standard grades—net tons) Total	Foundry	Malleable	Basic	Low Phos. Intermediate Low Phos. & Bessemer	Consumption* (By type of furnace—gross tons) Total	Cupola	Air	Electric
1952	61,306,723	2,864,722	3,013,267	48,253,390	7,175,344	61,550,961	5,438,294	449,646	118,820
1953									
Jan.	6,470,639	274,857	285,508	5,201,472	708,802	5,784,181	425,299	23,951	12,010
Feb.	5,802,580	186,983	294,619	4,640,718	680,260	5,207,103	417,556	24,155	13,542
2 mo.	12,273,219	461,840	580,127	9,842,190	1,389,062	10,991,284	842,855	48,106	25,552
Mar.	6,601,113	263,890	358,109	5,526,146	722,968	5,872,700	465,913	27,338	13,693
Apr.	6,161,640	244,671	327,095	4,885,642	704,232	5,567,515	477,929	28,212	11,675
May	6,508,487	210,021	347,666	5,236,990	713,810	5,844,427	436,343	24,366	13,877
June	6,288,049	201,646	313,404	5,075,028	697,971	5,581,403	436,927	24,332	12,145
July	6,425,855	213,469	344,377	5,145,135	722,874	5,579,692	367,081	19,880	15,471
Aug.	6,381,056	202,116	310,717	5,167,059	701,164	5,672,037	385,003	20,829	14,206
Sept.	6,121,399	209,444	310,441	4,926,986	674,528	5,378,517	393,292	21,775	16,039
Oct.	6,409,245	218,880	290,882	5,175,064	724,479	5,733,466	395,066	21,349	13,206
Nov.	5,995,511	201,047	277,181	4,859,252	658,031	5,324,537	343,233	17,528	15,842
Dec.	5,712,937	172,283	276,432	4,625,524	638,698	5,091,786	374,838	18,596	12,561
Total	74,878,511	2,599,307	3,736,431	60,465,016	8,347,817	66,637,364	4,918,480	272,311	164,267
1954									
Jan.	5,531,137	184,629	294,691	4,510,870	540,947	4,933,282	362,576	17,620	14,578
Feb.	4,764,613	156,178	272,707	3,911,670	424,058	.....	.....	.....	.....
2 mo.	10,295,750	340,807	567,398	8,422,540	965,005	.....	.....	.....	.....

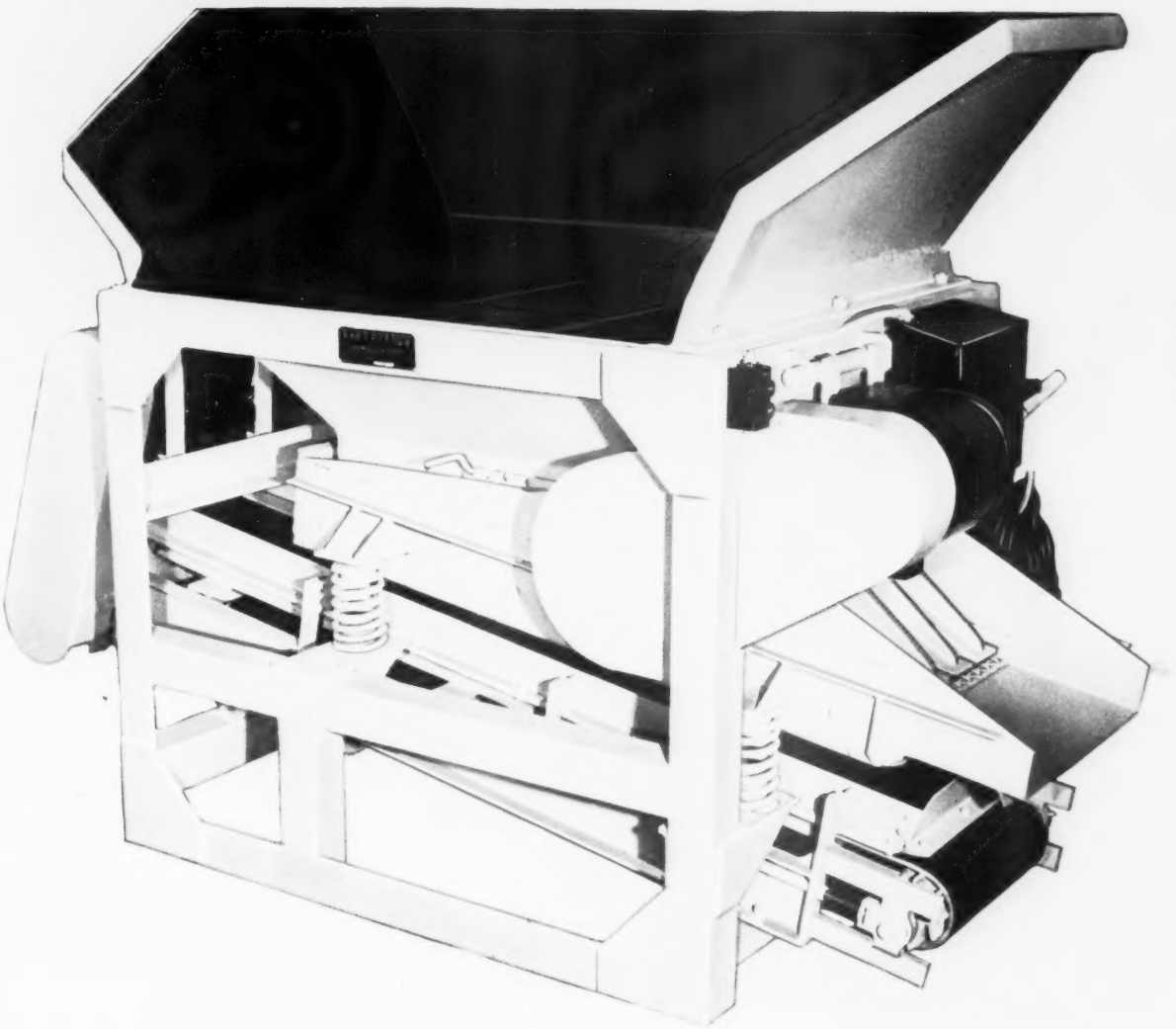
IRON AND STEEL SCRAP CONSUMPTION

(Gross tons*)

	All Scrap Total	All Scrap Purchased	By Types of Furnace: Cupola Total	Cupola Purchased	Air Total	Air Purchased	Electric Total	Electric Purchased
1951	68,518,208	33,822,431	11,090,607	5,878,939	1,203,740	441,099	8,391,919	5,389,005
1952	61,625,549	30,520,946	9,154,146	4,752,497	1,053,233	395,591	8,015,064	5,190,833
1953								
Jan.	6,256,718	3,061,551	810,254	413,971	95,430	35,695	795,292	517,963
Feb.	5,802,854	2,817,896	818,375	422,306	92,371	35,234	745,179	478,486
Mar.	6,536,867	3,211,476	901,786	464,110	103,034	38,583	857,760	563,489
Apr.	6,227,089	3,026,533	921,589	474,185	106,449	41,004	820,647	531,509
May	6,294,920	3,105,598	861,404	450,477	92,703	35,566	798,098	523,606
June	5,951,170	2,835,875	876,320	454,905	99,799	38,934	743,530	468,129
July	5,539,468	2,597,365	729,114	369,283	74,815	26,755	691,521	443,263
Aug.	5,637,759	2,614,153	753,272	390,741	77,047	28,167	678,968	428,332
Sept.	5,395,721	2,393,773	782,131	405,274	80,866	29,032	595,523	363,706
Oct.	5,628,568	.....	779,444	.....	75,618	.....	566,878	.....
Nov.	5,064,565	.....	687,498	.....	60,200	.....	477,666	.....
Dec.	4,690,277	.....	755,276	.....	68,002	.....	442,818	.....
Total	69,005,976	.....	9,676,463	.....	1,026,334	.....	8,263,880	.....
1954								
Jan.	4,574,384	.....	711,335	.....	71,202	.....	505,536	.....

*Source: U. S. Dept. of Interior, Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only. [3]Based on new sampling method; not comparable to prior figures.

FLOOR MOUNTED... *no pits required for the* NEW "60" PREPARATOR



NEW MACHINE DESIGNED FOR USE WITH ANY FRONT-END LOADER

The new "60" Preparator—designed for use in B&P Speedmullor-Preparator Units—completely conditions up to 40 tons of molding sand per hour, and can be installed without pits of any kind. This one "most needed" feature would make the new "60" Preparator big news, but look at the other new features:

1. 50% greater loading hopper capacity—no waiting to load.
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3. Loading height only 4'-2"—low enough for any loader—no ramps required.
4. Permanent magnet separation—no tubes, no rectifiers.
5. High-capacity high-frequency screening—new performance records.
6. New lump breaker—more effective handling of lumps.
7. Also available in a portable model.

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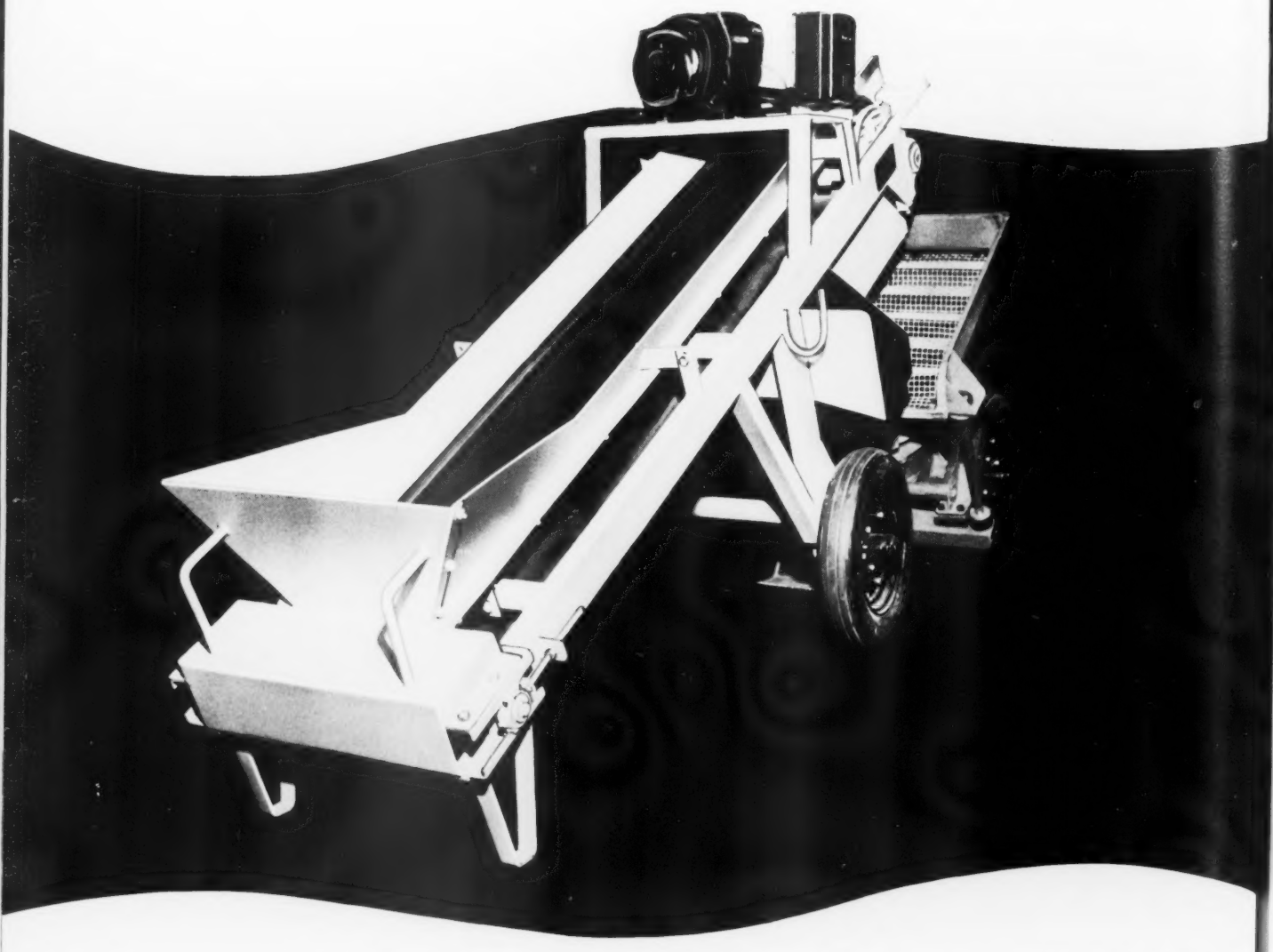
to improve your casting surface



The Magnaveyor is a sturdy new belt loading unit with a dependable permanent magnet separator, built by Beardsley & Piper to meet a definite need for better foundry sand preparation.

The Magnaveyor loads a B&P Screenarator, or other conditioner, at a rate of up to 1500 pounds per minute, and completely separates iron scrap, shot, and wires and nails from the sand being loaded. It is highly portable and may be easily moved by one man from foundry floor to floor. It is easily and quickly placed in operation with a Screenarator, or other device, and appreciably increases the efficiency of the conditioning unit with which it works.

A small knee-high hopper for shovel-loading makes the Magnaveyor particularly convenient for side floor sand preparation. Once you try it your molders will never want to do without it. Write now for information. *Beardsley & Piper, Div. Pettibone Mulliken Corp., 2424 N. Cicero Avenue, Chicago 39, Illinois.*

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Corp.,

Tentative Reference Radiographs for

Inspection of Aluminum and Magnesium Castings

ASTM Designation: E 98—53T

Issued, 1953

These Reference Radiographs have been reproduced from the Bureau of Aeronautics Reference Radiographs dated August 1, 1951, through the courtesy of the Navy Department, Bureau of Aeronautics

Scope

1. These reference radiographs illustrate various types and degrees of discontinuities occurring in aluminum and magnesium castings. They include a concise numerical system for designating these discontinuities based on the Tentative Industrial Radiographic Terminology for Use in Radiographic Inspection of Castings and Weldments (ASTM Designation E 52).

Note: The set of reference radiographs consists of 62 negatives covering discontinuities in aluminum alloy castings and 45 negatives covering discontinuities in magnesium alloy castings. The negatives are 4¾ x 8 in. and are contained in a 10 x 11¾ in. ring binder. Information on availability and price of the complete set can be procured from ASTM headquarters.

Bases for Use

2. The reference radiographs were selected from a large number of production radiographs of aircraft castings accumulated over a period of years, and are considered to be highly representative of the discontinuities

frequently found in aluminum and magnesium alloy castings. The grouping and system of designations selected were based on considerations of the best practical means of making this compilation of the greatest value and utility to those responsible for radiographic inspection in the field. The ASTM Terminology E 52 has been used as the basis for the definitions employed. In this connection, Section 1.2, Gas Porosity (in aluminum alloys), has been subdivided to illustrate essentially spherical porosity caused by hydrogen gas and elongated porosity resulting from stresses due to grain growth. Also Section 3.1 Foreign Material has been subdivided to illustrate foreign material of lower and higher density than the surrounding material.

Discontinuities Covered

3. The reference radiographs include one or more examples of varying degrees of the following discontinuities found in aluminum and magnesium castings:

Micro-shrinkage (magnesium alloys and aluminum alloy G10A)[a]		Gas holes
Shrinkage porosity or sponge (aluminum alloys only)		Hot cracks
Gas porosity (both round and elongated)		Shrinkage cavity
Segregation (aluminum alloys only)		Cold cracks
Core shift (aluminum alloys only)		Cold shut
Surface irregularities	Foreign materials	Misruns

[a] Tentative Specifications for Aluminum-Base Alloy Sand Castings (ASTM Designation: B26).

Use of Radiographs

4. For reproducing the negatives from the original radiographs, a reproduction technique was developed to insure retention of the original contrast and exact delineation of discontinuities present. The density was varied as required to provide for ease of viewing without removing films from the binder, as shown in Fig. 1. In this manner, production radiographs of densities of 2.0 or more viewed with a high intensity viewer may be directly compared with the reference radiographs viewed in the manner shown in Fig. 1.

Additional copies of this specification may be obtained from the American Society for Testing Materials, 1916 Race St., Philadelphia 3, for a nominal sum.

FOUNDRY Data Sheet

Tentative Recommended Practice for Codification of Light Metals and Alloys, Cast and Wrought

ASTM Designation: B 275—53T

Issued, 1952; Revised, 1953

Scope

1. This recommended practice covers a system for designating light metals and alloys, cast and wrought. The Designations used in ASTM specifications under the jurisdiction of ASTM Committee B-7 on Light Metals and Alloys, Cast and Wrought, conform to this recommended practice.

Basis of Codification

2. (a) The designations for alloys and unalloyed metals are based on the chemical composition limits in ASTM specifications.

(b) The temper designation, which is used for all metal forms except ingot, follows the alloy designation and is separated therefrom by a dash.

Alloys

3. (a) Designations for alloys consist of not more than two letters representing the alloying elements (Note 1) specified in the greatest amount, arranged in order of decreasing percentages, or in alphabetical order if of equal percentages, followed by the respective percentages rounded off to whole numbers and a serial letter (Notes 2 and 3). The full name of the base metal precedes the designation, but it is omitted for brevity when the base metal being referred to is obvious.

NOTE 1.—For codification, an alloying element is defined as an element (other than the base metal) having a minimum content greater than zero either directly specified or computed in accordance with the percentages specified for other elements. The amount present is the mean of the range (or the minimum percentage if only that is specified) before rounding off.

NOTE 2.—The serial letter is arbitrarily assigned in alphabetical sequence starting with A (omitting I and O) and serves to differentiate otherwise identical designations. A serial letter is necessary to complete each designation.

NOTE 3.—The designation of a casting alloy in ingot form is derived from the composition specified for the corresponding alloy in the form of castings. Thus, a casting ingot designation may consist of an alloy designation having one or more serial letters, one for each product composition, or it may consist of one or more alloy designations.

(b) The letters used to represent alloying elements should be those listed in Table I.

Table I—Letters Representing Alloying Elements

A—Aluminum	G—Magnesium	Q—Silver
B—Bismuth	H—Thorium	R—Chromium
C—Copper	K—Zirconium	S—Silicon
D—Cadmium	L—Beryllium	T—Tin
E—Rare Earths	M—Manganese	Y—Antimony
F—Iron	N—Nickel	Z—Zinc
	P—Lead	

(c) In rounding-off percentages, the procedures described in the Recommended Practices for Designating Significant Places in Specified Limiting Values, (ASTM Designation: E 29) should be used.

(d) When a range is specified for the alloying element, the rounded-off mean should be used in the designation.

(e) When only a minimum percentage is specified for the alloying element, the rounded-off minimum percentage should be used in the designation.

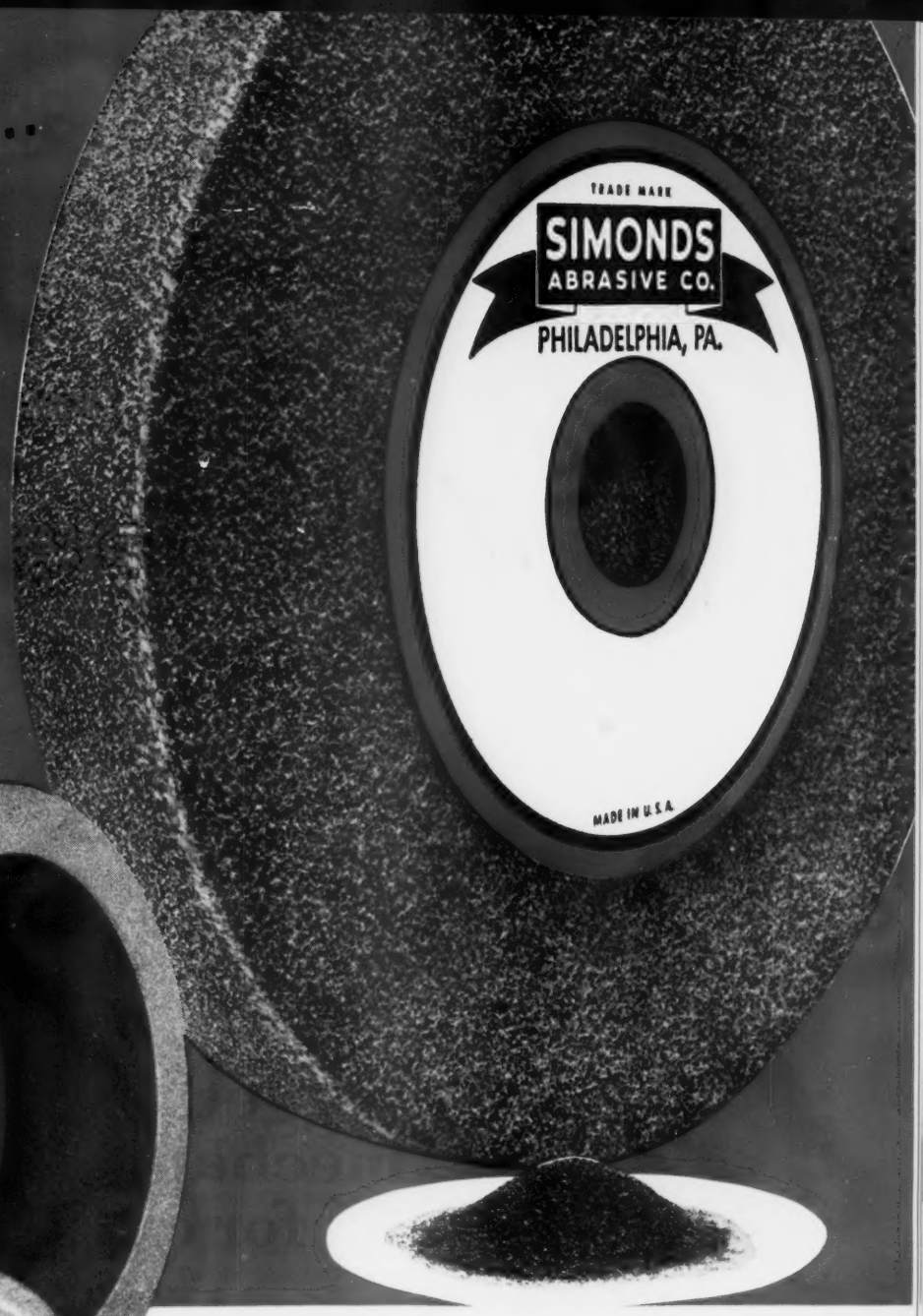
Unalloyed Metals

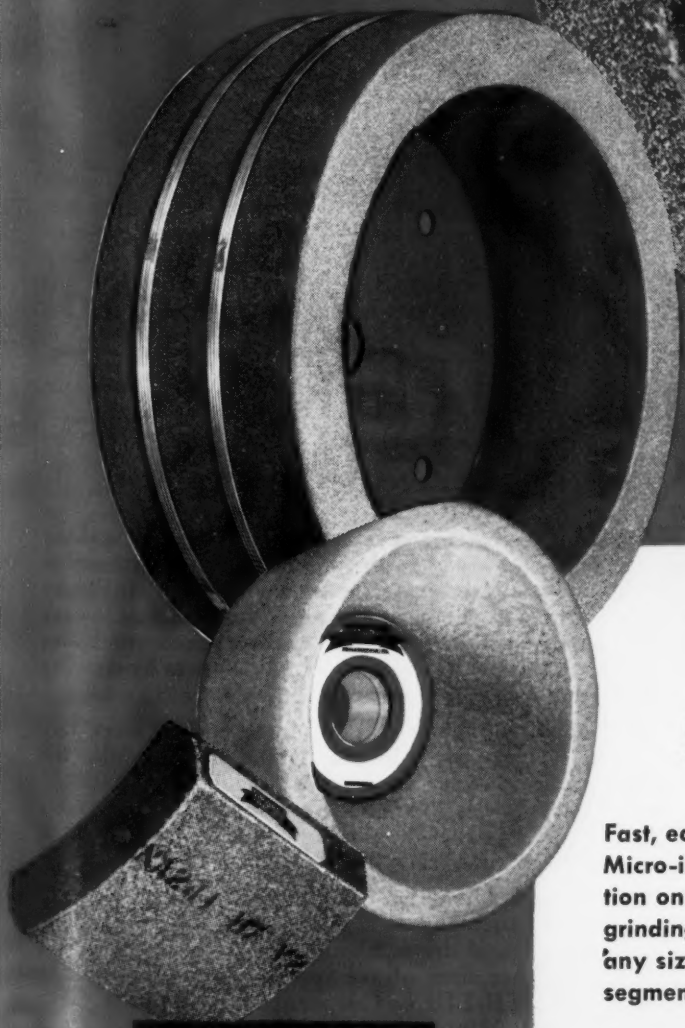
4. Designations for unalloyed metals consist of the specified minimum purity, all digits retained but dropping the decimal point, followed by a serial letter (Note 2). The full name of the base metal precedes the designation, but it is omitted for brevity when the base metal being referred to is obvious.

Additional copies of this specification may be obtained from the American Society for Testing Materials, 1916 Race St., Philadelphia 3, for a nominal sum.

any way you look at it...

from grinding wheels to grain





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SHOVELOADER

SELLING MORE MALLEABLE CASTINGS

Is Topic at Malleable Founders' Marketing Conference

By FRANK G. STEINEBACH
Editor

HOW can the malleable foundry industry sell more castings? Nearly 100 sales managers and salesmen of the industry discussed many ramifications of this problem at the fifth annual market development conference held Apr. 8-9 at Carnegie Institute of Technology, Pittsburgh, by the Malleable Founders' Society.

The program provided an opportunity to consider lessons learned from past experience, the present situation, and the future outlook. Subjects discussed included pearlitic malleable, specifications, technical progress, competitive materials, and the place of management, sales management and salesmanship in the marketing picture.

Needs New Selling Approach

Conference visitors were welcomed to the campus of Carnegie Institute by Dr. Webster N. Jones, vice president, and by Admiral Ludwig of the Metallurgical Department. Dr. Jones told of the work of the institute in training men for industry, and the methods of financing. He discussed scholarships provided by industry, and emphasized that any industrial organization should not expect its scholarship students to go with that company following graduation. All conference meetings were held in the beautiful new Industrial Administration building on the campus.

In opening the meeting, George T. Boli, president, Northern Malleable Iron Co., St. Paul, and president of the society, stated that the malleable iron industry needs a new approach to the problem of selling. Over a period of years, malleable iron has not shared in the growth of the industrial market. Today malleable iron is an engineered product, and the malleable industry's chief concern is service. Customers' engineers are concerned with the design of product, but too frequently they are not familiar with the properties and advantages of malleable iron castings.

Mr. Boli stated that engineers developing machines often use quick methods of fabrication to build pilot models. Too frequently these methods are utilized when production starts. After production is under way it is much harder to effect changes in components, although advantages would accrue from such changes. To overcome this, foundry engineers must work with designers when development is in progress. Mr. Boli emphasized that many companies welcome the assistance of foundry engineers in designing cast parts. Therefore, the malleable industry must accelerate the development of sales engineers to provide this type of service. In closing, Mr. Boli expressed pleasure over the number of young salesmen attending the conference.

Tom A. Scanlan, director of sales, Eastern Malleable Iron Co., Newburgh, N. Y., and chairman of the society's Market Development Committee, presided at all sessions. In his opening remarks, he urged that the malleable industry bolster its sales by improving the product, providing the most economical production, rehabilitating production facilities and developing capable sales engineers. He charged that the industry has not devoted sufficient attention to securing business from competing methods and materials. In his opinion, the sales function of any foundry is just as important as any of the production operations. Therefore, selling malleable castings should have the technical and scientific approach.

A panel considering "What We Have Learned from Past Experience" proved interesting. Lloyd Young, Superior Steel & Malleable Castings Co., Benton Harbor, Mich., approached the subject from the standpoint of sales practices. To be successful in merchandising a product, everyone in the company, including production workers and office staff, must engage in selling along with the sales department. Regardless of how hard the salesman works, much of his success rests with the operating department. The organization must be sure of a high-quality product delivered at a price that is fair to both customer and company. Additional tonnage of malleable iron cannot be developed by selling below cost plus a fair profit.

Mr. Young said his company has undertaken an extensive advertising and promotion program based on product development. Samples of the company's advertising copy were on display. These advertisements are based on case histories of conversions through product design. The speaker reported that in 1953 the Superior Steel & Malleable Castings Co. secured $457,000 in sales as a direct result of jobs handled through the Product Development Department. With other companies carrying on programs of this nature, Mr. Young urged all organizations represented at the conference to get into the product development program.

A. C. Sinnett, Terre Haute Malleable & Mfg. Corp., Terre Haute, Ind., considered the subject from the angle of cost methods. He stated that each operation is a production center, and therefore a cost center, and rates should be developed for each. He indicated that it is not possible from the practical standpoint to determine the actual cost of castings. The goal is to get as close to actual cost as practicable.

Mr. Sinnett warned that each foundry is not set up to do all types of work. Therefore, a foundry should confine itself to the class of work it is best equipped to produce. When the product mix is changed, it should be remembered that cost methods in use may not be accurate. Mr. Sinnett stated that the accounting department can be of considerable assistance to the sales department.

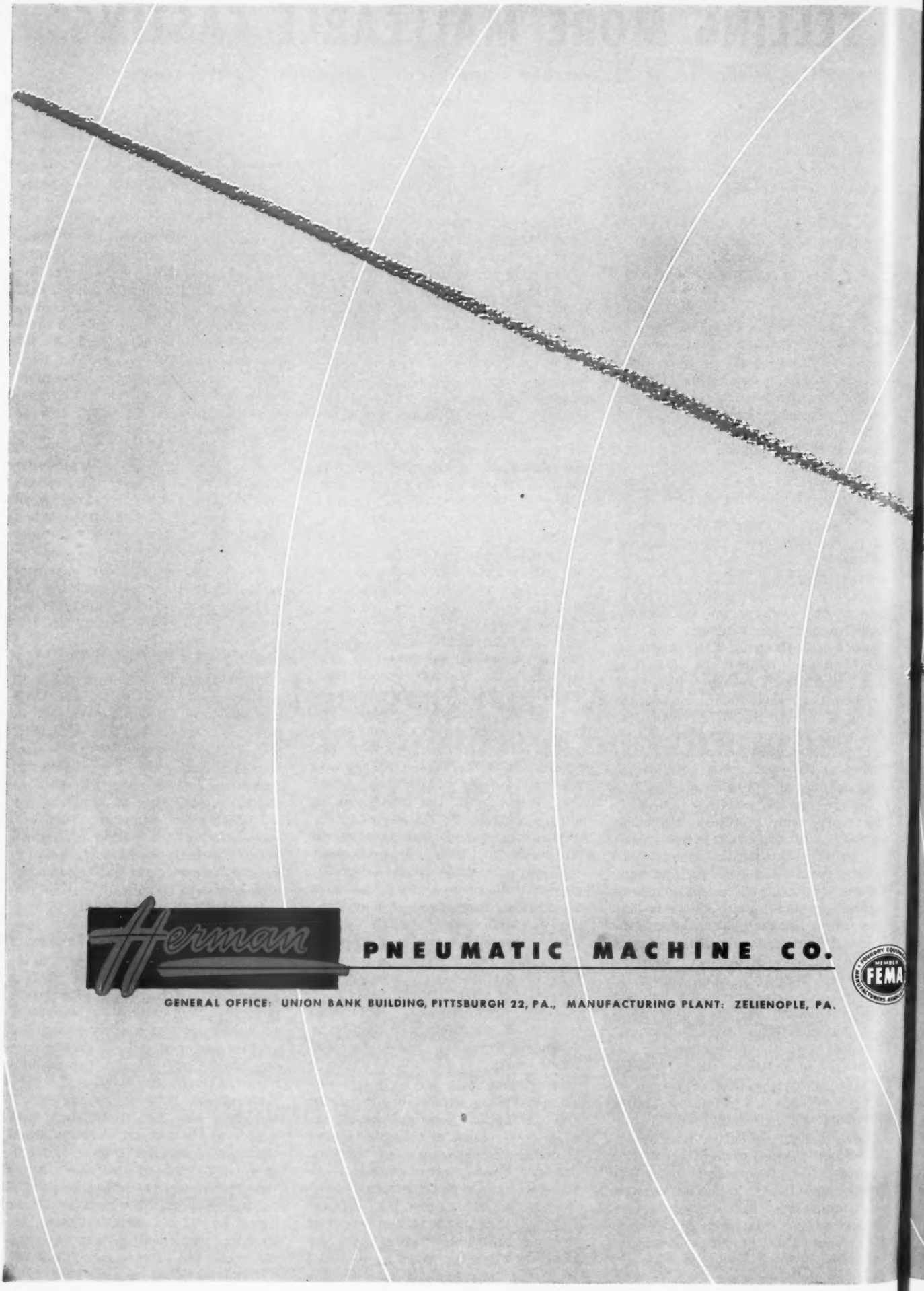
Improved Production Practices

Much progress has been made in production practices in the malleable iron industry, according to W. J. MacNeill, Badger Malleable & Mfg. Co., South Milwaukee, Wis. Advancements include continuous pouring, duplex melting, early work with induction melting, use of additives, use of continuous annealing furnaces, shortening of the period of anneal, use of synthetic sands, shell molding, greater knowledge of gating, and improvements in cleaning.

Mr. MacNeill stated there had been no progress in cutting scrap loss, and that this loss results in the main for the same old reasons. He also indicated the need of better pattern equipment and further improvements in molding and coremaking machines. In conclusion, he recommended the greater use of statistical quality control, which will permit the maintenance of the quality level.

George F. Sullivan, managing editor, *The Iron Age*, New York, took a look at the general business situation, and outlined the good and not-so-good factors of the short range outlook. Among the latter, he pointed to the fact that business is off as much as 20 per cent, railroads are spending considerably less for capital goods and defense spending is off.

(Continued on page 176)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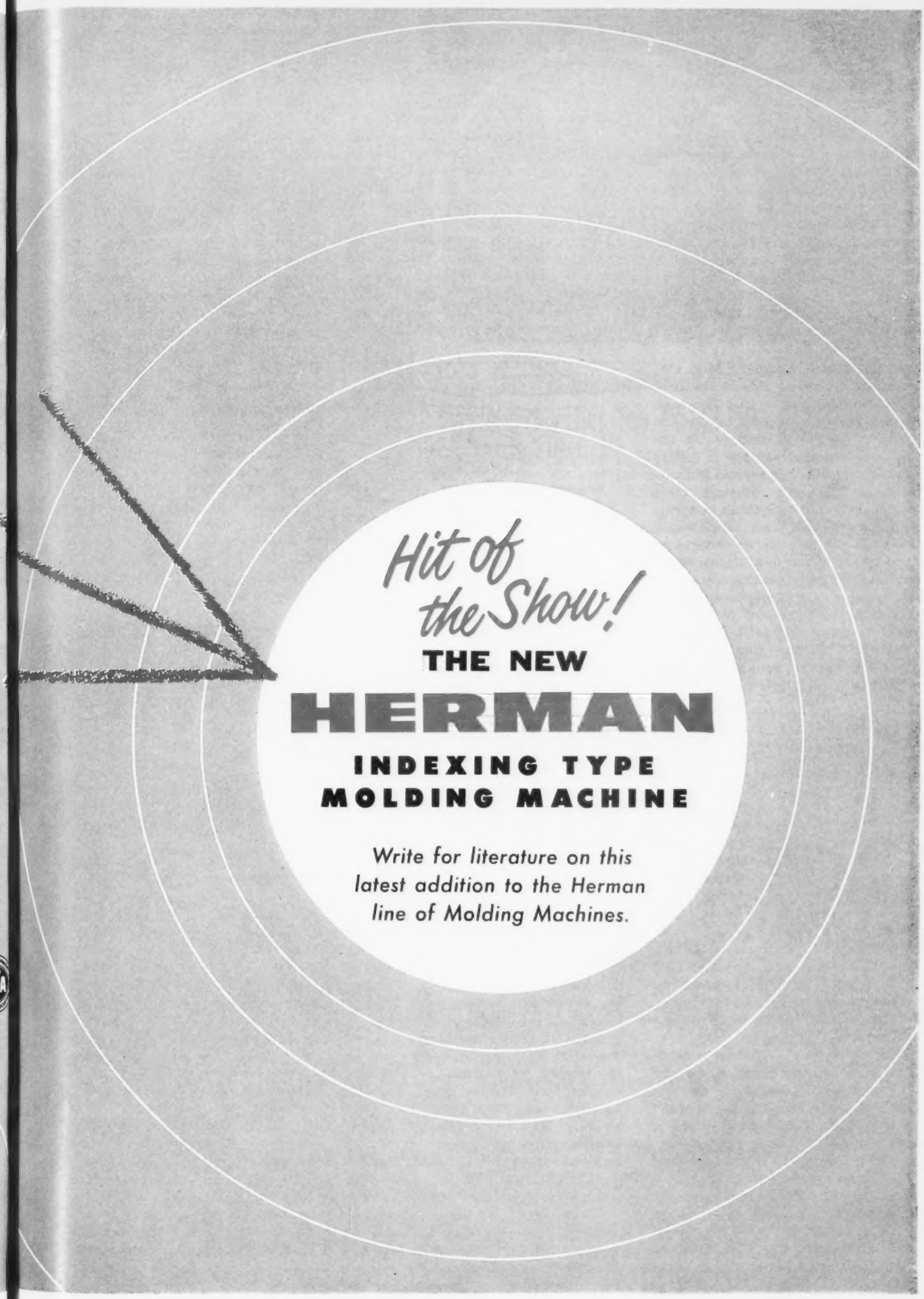
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(*Continued from page* 173)

On the brighter side he stated that auto production still is high, construction enjoyed a good first quarter, public works are $2 billion higher than a year ago, plant and equipment purchases are off only 4 per cent, defense spending still involves $73 billion, personal income is $4 billion higher after taxes, and we are using up things faster than they are being produced. Mr. Sullivan believes the inventory correction will end around mid-year. He was quite optimistic on the long-range view, citing population increase, improvement in living standards and development of new products through research as factors which will influence the trend.

Cliff Lambert, Eberhard Mfg. Co., Division of Eastern Malleable Iron Co., Cleveland, emphasized the need of extending sales policies beyond the selling of malleable castings. In the final analysis, the industry is selling a service, and in that service the material is indicated. Although most malleable foundrymen think in terms of that serviceable item as malleable iron castings, it must be recognized that malleable iron is not always the material best suited to the customers' requirements. Therefore, it should be possible to be of service to the customer by supplying technical information and perhaps making recommendations on a suitable material which most nearly meets the requirements.

Castings Possess Advantages

Mr. Lambert discussed the characteristics of malleable castings, and did the same for steel fabrications. He pointed out that castings in general are free from directional differences in properties, that the casting process lends itself to the formation of intricate integral parts with strength and rigidity frequently not otbainable by other means of fabrication, that malleable iron is relatively free from progressive or fatigue fracture, that increased strength usually is accompanied by increases in durability and toughness, and that malleable iron has excellent machinability.

During the meeting, those attending the conference saw a forging film, a steel castings film, and the society's film, "This Moving World."

Pearlitic malleable iron offers a tremendous challenge to the industry, according to Mark M. Miller and B. C. Yearley, National Malleable & Steel Castings Co., Cleveland. Mr. Miller indicated that many companies in the industry are producing malleable and stated that the Cleveland plant of National now devotes 40 per cent of its product to pearlitic malleable iron. He stressed the importance of adequate specifications as a means of increasing the use of malleable iron, and indicated that the present ASTM specifications are not realistic.

Mr. Miller believes that there are too many grades, and that the listing of typical brinell hardness number ranges requires explanation on the part of the salesman. He pointed out that whenever it is necessary to explain a specification or to discuss a company's particular inability to produce within a range, sales impetus is lost. He recommended that the society organize a special committee to study and discuss specifications and policy for pearlitic malleable. The subject was discussed at considerable length and it was the consensus that the board of directors should authorize the organization of such a committee.

"Listen! I don't care what Ralph Lee says—I'll prepare this cake mold MY way!"

James H. Lansing, technical and research director of the society, outlined a number of recent developments of interest to the industry, including shell molding, automatic molding, blowing of molds, D process, pressure molding, induction melting, and the experimental work in the hardening of malleable iron and the gating and feeding project being conducted.

Since the conference previously had indicated the importance of studying the welding of malleable iron, a discussion by J. Wesley Cable, consulting engineer, New York, on "Fabricating Malleable Practice" proved exceptionally interesting. Mr. Cable outlined some work at Lehigh Foundries Inc., Easton, Pa., in connection with silver brazing of malleable iron castings. He explained that it is necessary to keep the temperature of the iron below 1325° F, therefore ordinary high-temperature welding can not be used unless the casting is reannealed to eliminate any trouble.

Experience shows that the brazing is most successful with Grade A malleable iron. It is necessary to watch for inclusions, and it is most important that the surfaces to be brazed be absolutely clean. The carbon content is critical. The cleaning method must remove all graphite and dirt. After considerable experimental work the cleaning process now is limited to either sand blasting or pickling. Care must be taken not to use wire brushing or any operation which tends to pull the carbon out of the metal and smear it over the surface. Mr. Cable recommended the handkerchief test. In this the surface is wiped with a clean handkerchief, and if any trace of dirt can be noted on the cloth, the metal surface is not suitable for brazing.

Describes the Procedure

Heat must be applied slowly to get the soaking effect without setting up temperature gradients that will exceed 1325° F. A flash copper plate is excellent to prepare the surface for the brazing operation. Experience has shown that such plating is more satisfactory than galvanizing. Mr. Cable pointed out that brazing gets its strength in shear; with a length of overlap equal to five times the thickness, the metal will fail before the brazed joint. In the brazing operation, all surfaces of the metal must be at the brazing temperature. Mr. Cable indicated that the process has considerable possibility for the malleable industry.

John Nabrezny, Michigan Malleable Iron Co., Detroit, outlined the various sales tools and their uses, including visual aids, samples, good letters and the telephone. He stressed the importance of getting the promotional material into the hands of the proper people.

A panel discussed the general subject of management, sales management and salesmanship. Myron M. Ruby, Newark Malleable Iron Works, Newark, N. J., outlined the breakdown of the sales department and considered its functions and activities. Stewart C. Watson, Acme Steel & Malleable Iron Works, Buffalo, considered these three classifications of the salesman's functions: 1. What does the customer expect from the salesman? 2. What does the company expect from the salesman? 3. What does the salesman expect from the company?

He indicated that the customer desires to be visited and contacted, needs the help of the design department and wants methods presented that will save money on the castings. He stated that the company expects

(*Concluded on page* 178)

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(*Concluded from page* 176)

the salesman to sell the type of product the company can produce in its regular line of business. The salesman expects the company to produce castings regular in design and to specification, desires a workable selling arrangement and the tools with which to work.

Cal C. Chambers, Texas Foundries Inc., Lufkin, Tex., indicated that it was management's responsibility to provide the customer with the answer to his needs. Management must have a definite policy outlined, must determine compensation of the salesman and must provide for training the people who carry out these policies. Furthermore, management must set a goal and must carry on a program of public relations that will aid in the sales effort.

In discussing "Measuring Markets," Joseph Profita, Methods Engineering Council, Pittsburgh, considered factors in determining customers and prospects, considerations which govern the nature of the market, size of the market and the extent of the individual foundry's participation in the total market.

In the concluding talk, Frank Rackley, president, Jessop Steel Co., Washington, Pa., reviewed general economic conditions from the standpoint of proving by and large that the economy is still in a very healthy state. He attributed most of the present downswing to inventory adjustments. He made a big hit with the salesmen present by proclaiming an aversion to reports, because if his salesmen write lengthy reports he is obliged to read them. Mr. Rackley's only counsel to salesmen is that they work a little harder. A study made by his company shows that the salesmen who make the most calls get the most orders.

Radiation Booklet Ready

A handbook, "Protection Against Betatron-Synchrotron Radiations up to 100 Million Electron Volts," contains recommendations made by the National Committee on Radiation Protection to serve as a guide for protection against the general hazards of radiation sources as they apply to high-energy electron accelerators of the betatron and synchrotron types. The protection requirements for operating personnel, hospital patients, and the public against potential hazards of the accelerators are outlined. The publication, National Bureau of Standards Handbook 55, may be ordered from the Government Printing Office, Washington 25. Cost, 25 cents.

INVESTMENT CASTING INSTITUTE

Holds Successful Spring Meeting

APPROXIMATELY 75 members of the investment casting industry met in Cleveland, May 5-6, for a successful spring meeting of the Investment Casting Institute. From the interest being evidenced in activities of the institute, this newest organization of the foundry industry appears well established.

First day of the spring gathering was devoted to meetings of committees and directors. In opening the first general meeting the second day, K. M. Bartlett, Thompson Products Inc., Cleveland, and president of the institute, discussed briefly the organization's activities and plans.

He stressed the importance of the survey of the industry which is well under way, the survey of users of precision castings which recently was undertaken, and the abstracting service. He announced the employment of an organization to handle promotion work, including the preparation of articles for the technical press.

Lists Aims of Institute

Mr. Bartlett said that the institute would strive to expand the use of investment castings, with proper appreciation of their advantages and limitations. The institute also will attempt to promote a better understanding between customers and producers.

R. S. Banister, Midwest Foundry Co., Coldwater, Mich., reported for the Membership Committee. The institute recently had a nucleus of 18 industry members and 8 affiliate members.

Some of the technical problems met in making investment castings were discussed by three speakers. Dr. Nicholas J. Grant, Massachusetts Institute of Technology, explained how mold and metal temperatures affect grain size and resultant physical properties of the metal. Heating the mold before pouring not only helps to prevent misruns, but also permits pouring at lower temperatures.

Dr. Grant pointed out that shape of the casting and the position of the mold cavity in the flask will have a bearing on the cooling rate of the metal and consequently on its grain structure. Application of the part being cast is the important factor in deciding whether to seek to attain a coarse or fine grain structure.

Use of induction melting equipment was discussed by James Coley, sales manager, Ajax Electrothermic Corp. Main advantages of this type of equipment, he said, are: 1. Rapidity of meltdown. 2. Cleanliness of the bath. 3. Efficiency both in heat use and in alloy recovery. Mr. Coley recommended that individual pieces of the furnace charge be of such a size that they can be packed so as to occupy 50 to 60 per cent of the unit's capacity.

Suggestions regarding melting practice were offered by Roger W. Waindle, president, Wai Met Engineering Co. They included use of clean metal, rapid melting, avoidance of overheating, and degassing of the melt before pouring. In discussing deoxidizing materials for ferrous and nonferrous melts, he recommended that the material be plunged into the bath. Mr. Waindle said that rare earth additions have been used with success, providing a cleaner metal with improved fluidity and better physical properties in the casting.

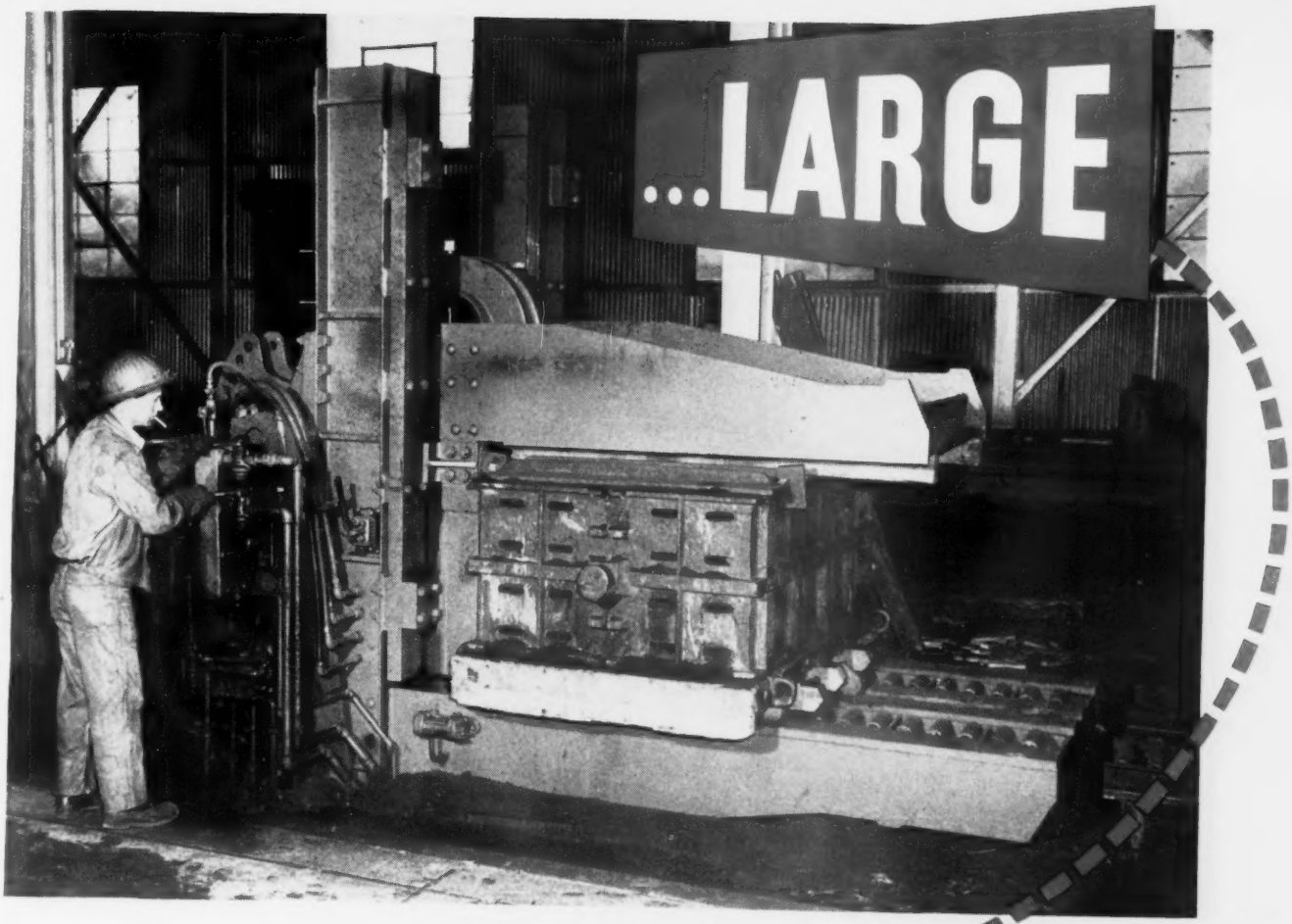
Frank C. Howard, chairman, Howard Foundries Inc., Chicago, declared that while a large part of current production of investment castings is for military uses, the opportunities for commercial business are unlimited. The industry is selling an extremely high quality product, consequently it must do a selling job to acquaint engineers with the advantages of such castings.

Discussing market opportunities, W. I. Matthes, executive vice president, Arwood Precision Casting Corp., also pointed to the need to educate users as to what can and can not be done in investment casting of parts. He also stressed the advantage of standardizing on material specifications and compilation of inspection standards.

Ted Operhall, vice president, Misco Precision Casting Co., discussed investment casting applications in defense work, particularly those for aircraft use.

V. S. Lazzara, president, Casting Engineers Inc., in speaking of some of the industry's sales problems, stressed the need of educating consumers concerning the adaptability of investment castings.

Charles Yaker, Misco Precision Casting Co., and chairman of the Material Specifications Committee, reported on work of that group in surveying industry members regarding alloys now being melted and in preparation of specifications covering typical chemical specifications. H. B. Kuebrich, Thompson Products Inc., reported for the Inspection and Standard Quality Practice Committee concerning the preparation of standards covering tensile tests and nondestructive testing practice.



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INSTITUTE OF BRITISH FOUNDRYMEN

Marks 50th Anniversary with Jubilee Celebration

By VINCENT DELPORT
European Manager

THE Institute of British Foundrymen marked the 50th anniversary of its establishment on Apr. 9. On that date in 1904, a meeting was called in Birmingham by an enthusiastic foundryman, Frederick W. Finch. It was attended by exactly six persons—Robert Buchanan of Birmingham, C. Moorhead of Rugby, James Ellis of Southampton, F. W. Shaw of Birmingham, W. Vickers of Birmingham (representing F. J. Cook) and Mr. Finch.

These six men formed themselves into the British Foundrymen's Association, with Robert Buchanan as president and F. W. Finch as secretary and treasurer. The remainder of those present became the council, with power to add to their number. Four months later, the first annual convention was held at Manchester, with 50 members attending, out of a total membership at that time of 89. By the end of the year, membership had reached 100.

These facts are related in a booklet "The First Half Century—The History of the Institute of British Foundrymen," by Tom Makemson, who has been secretary of the institute during the past 27 years. The brochure, published especially for the jubilee celebration, depicts the development of the institute from its early beginnings to the present, when the membership exceeds 5000 with members in every industrial country of the world. There are now 12 branches, geographically distributed throughout the British Isles, and 8 local sections attached to four of the branches. The London branch, with some 850 members and four local sections, claims to be the largest single technical unit of the foundry industry in the world. In overseas countries are two fully-fledged branches, one in Australia (Victoria), the other in South Africa.

President Longden, left, presents Dennis Bailey, winner of jubilee paper competition, with his prize

The activities of the institute are carried out through local meetings, annual conventions and the continuous work done by the Technical Council and its numerous subcommittees. Considerable interest is also shown in the field of education and technical training.

A milestone in the life of the institute was the granting of a Royal Charter by King George V on Nov. 25, 1921. Prior to this event, the British Foundrymen's Association changed its name to the present one, "Institute of British Foundrymen."

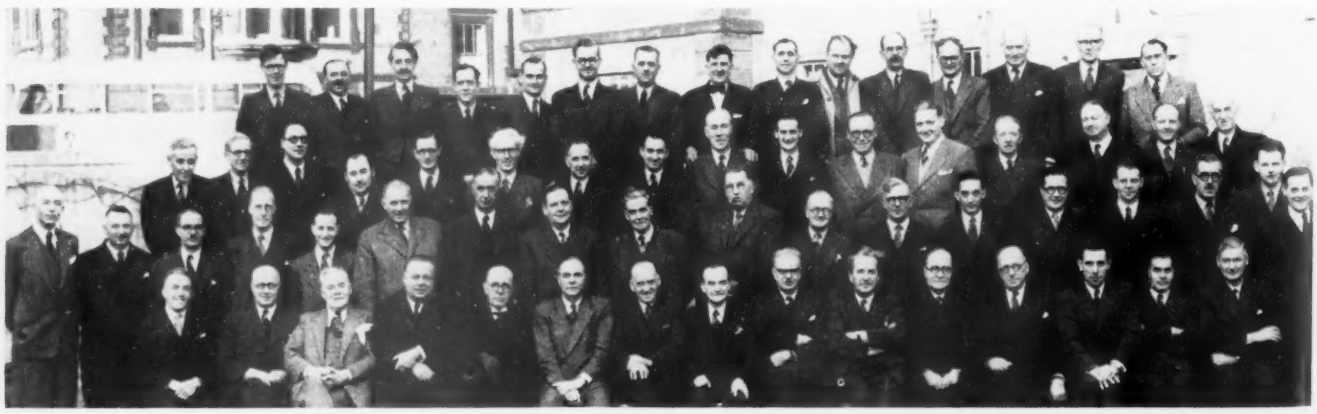
To commemorate the jubilee, a special competition had been opened earlier to members of the institute under 30 years of age, who were invited to submit papers on subjects of their choice. The competition was organized on a branch basis, with prizes of £10 ($28) for the best paper received by each branch, and a national award of £25 ($70) for the paper judged the best of all. Twenty-five papers were submitted. Prizes were donated by members of the Teconic group of companies.

Dennis Frederick Bailey of Coventry won the national award as well as the Birmingham Branch award for his paper "Some Aspects of Shell Molding Technique." His award was presented to him at the special jubilee meeting held in London on Friday, Apr. 9. Branch awards are to be presented to the winners at the respective branches.

Other winners include Robert Kirkham Jackson, Lancashire Branch, for his paper "Shell Molding and the Economic Use of Shell Molding Material"; Neville Yoxall Newton, London Branch, for his paper "Some Aspects of Metallurgical Control in the Modern Steel Foundry"; William Burn Hendry, Newcastle Branch, for his paper "Some Influences of Cupola Charge Composition upon the Properties of Gray Cast Iron"; and Alan Dale, Tees-side Branch, for his paper "Microscopy in the Iron Foundry."

Main feature of the jubilee meeting, which was presided over by E. Longden, president of the institute, was a lecture given by V. C. Faulkner and S. H. Russell, past presidents, entitled "Developments of the

(*Continued on page* 183)



This view shows members of the Council of the Institute of British Foundrymen for the period 1953-54. President E. Longden is in the center, front row. To his right are John Bell, senior vice president; C. Dadswell, V. C. Faulkner; J. Gardom; D. H. Wood; and P. A. Russell. To President Longden's left are Dr. A. Everest, senior vice president; C. Gresty; Secretary Tom Makemson; and C. W. Biggs

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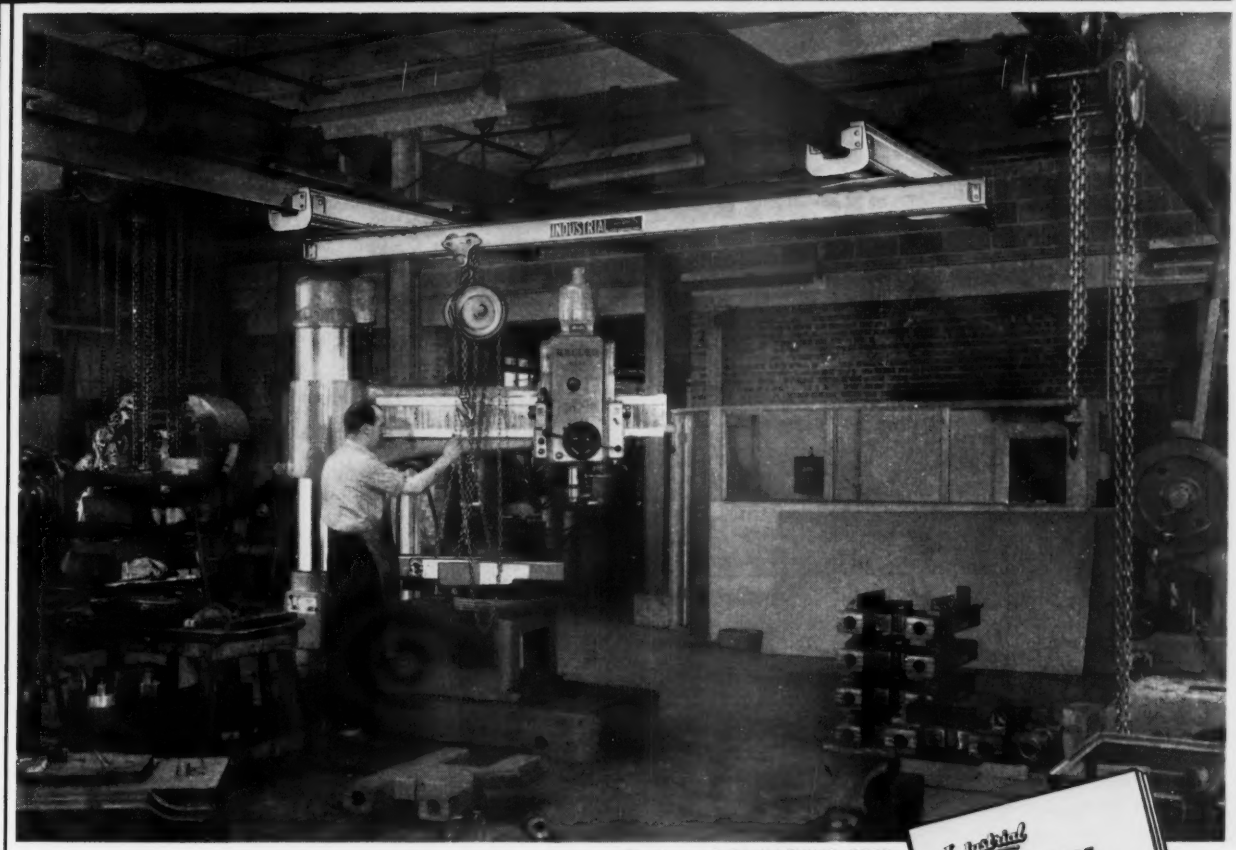

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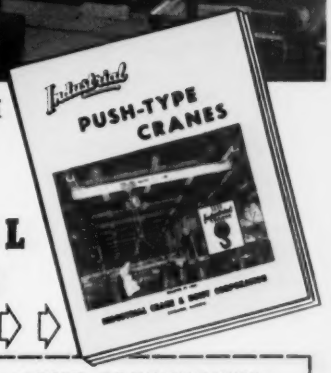

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CLEVELAND, OHIO

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

(*Continued from page* 180)

Foundry Industry during the Past Fifty Years." The authors dealt with the progress made in all sections of the foundry industry during the past half-century. Among the many interesting points they made were the following:

Brass and Bronze—Brass founding is by far the oldest section of the foundry industry. Metallographic examination did much to improve the quality of alloys and to explain failures. The advent of the two world wars caused a demand for higher strengths and better all-round qualities. A new range of alloys has been developed which when heat treated gives tensile strengths more than double those of the alloys of 1918. In regard to melting, progress has developed them from the early pit furnaces to various types of electric furnaces, which came into use by 1913. A recent improvement has been the availability of ingots for remelting to specification.

Gray Iron—Fifty years ago, metallurgical knowledge was confined to the six variables in cast iron: Graphitic carbon, combined carbon, silicon, sulphur, phosphorus and manganese. Metallography and other means of investigation have increased this knowledge considerably. In 1910, ordinary commercial iron had a tensile strength of from 9 to 12 tons per square inch. Semisteel appeared in 1912; this was followed, after World War I, by the gradual use of alloy additions. Progress in foundry technique was also made. These developments culminated by 1948 in cast irons reaching 26 tons per square inch in tensile strength. New ranges of irons have been introduced that combat heat and wear resistance, and improve other physical properties, the latest development being nodular, or spheroidal graphite, iron.

Malleable Iron—First produced in 1722, and described by Reaumur, the European process became known as "Whiteheart," to distinguish it from the American "Blackheart." Considerable secrecy was observed in the industry up to World War I; much metal was still melted in crucibles, even in 1916. The progress made since then in melting practice and heat treatment was reviewed briefly by the authors. The present highest specification for malleable iron calls for an ultimate tensile strength of 22 tons per square inch with an elongation of 14 per cent, but, as the authors state, those figures are already exceeded by the best makers.

Aluminum Alloys—A series of aluminum-zinc and aluminum-copper alloys had been developed by 1910; an aluminum-copper-zinc alloy, cast in sand, had a tensile strength of 10-12 tons per square inch with elongation of 6-10 per cent. During the 1914-18 war, considerable advance was made, and by 1920 many improved alloys were available for pistons and other airplane and automobile parts, by 1949, the British Standards Institution published a list of 20 alloys covering all purposes. Present day standard aluminum alloys will, after appropriate heat treatment, give a tensile strength of 18 tons per square inch, or, if chill cast, up to 21 tons. The low-frequency induction furnace now is considered suitable for heavy and continuous work.

The authors mentioned that by far the greatest output of aluminum alloys is made in the form of die castings, although, quite recently, the shell molding process has come into being. The application of die casting to iron castings was reintroduced in Great Britain during the last war, much of the technique having been learned from the United States.

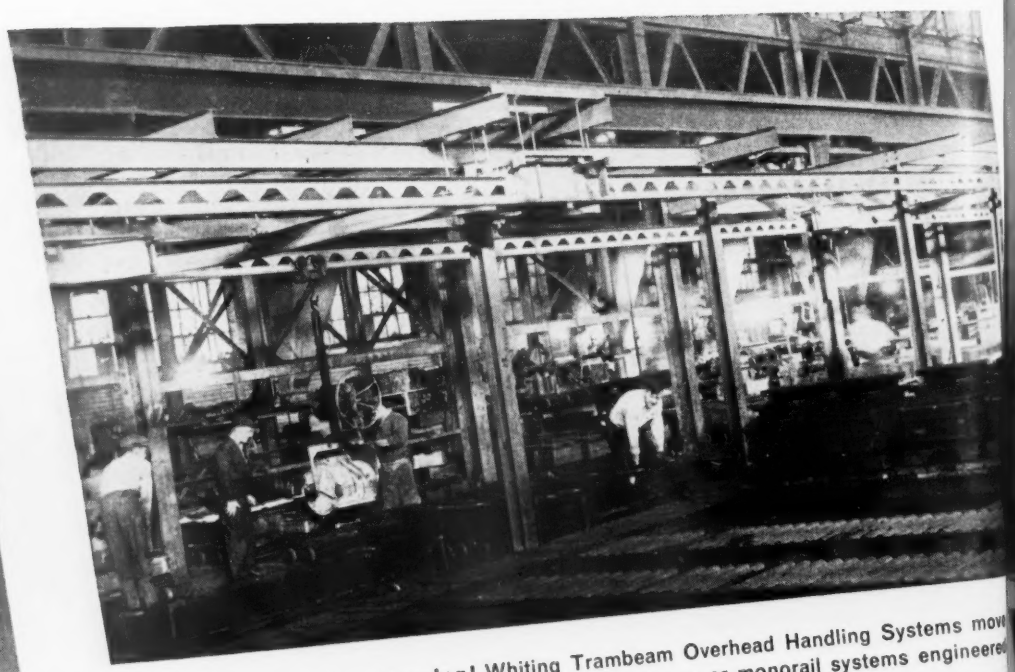
Magnesium Alloys — The authors consider the production of magnesium casting to be the most interesting and novel development of foundry work in the past 50 years. Difficulties had to be overcome to avoid explosion in sand molds through contact with water. This was overcome in 1924 by the use of sulphur and boric acid as sand inhibitors, the molds being skin dried only. By 1936, the heat treatment of magnesium alloys was developed, resulting in higher tensile strength and ductility. Up to 1945, further advances in heat treatment were made, and in 1948 zirconium was introduced, giving a stronger and corrosion-resistant alloy. Nowadays, a tensile strength of 13 tons per square inch with 6 per cent elongation can be obtained, or even exceeded in die casting.

Centrifugal Castings—The development of spun iron pipe was developed in Great Britain from a machine produced by two Brazilian engineers, who utilized water-cooled molds. One machine was installed in Toronto, Canada, about 1916. The Stanton Ironworks took out a license for this process in 1919, and other extensive experiments produced, by 1922, satisfactory pipes in 12-ft lengths. Eventually an output of 450,000 tons per annum was realized, in sizes ranging from 2 to 27 in. diam.

(*Concluded on page* 186)

Left to right, top view, are S. H. Russell and V. C. Faulkner, past presidents and authors of the lecture delivered at the jubilee meeting; President E. Longden; and Secretary Tom Makemson. Below, left to right, at the head table at the banquet, are President Longden; A. Brizon, president, International Committee of Foundry Technical Associations; Vincent Delport, European manager, *Foundry;* Sir Archibald Forbes, chairman, Iron and Steel Board; and F. W. E. Spies, president, Netherlands Foundry Technical Association and past president, International Committee of Foundry Technical Associations

How to reduce costs t



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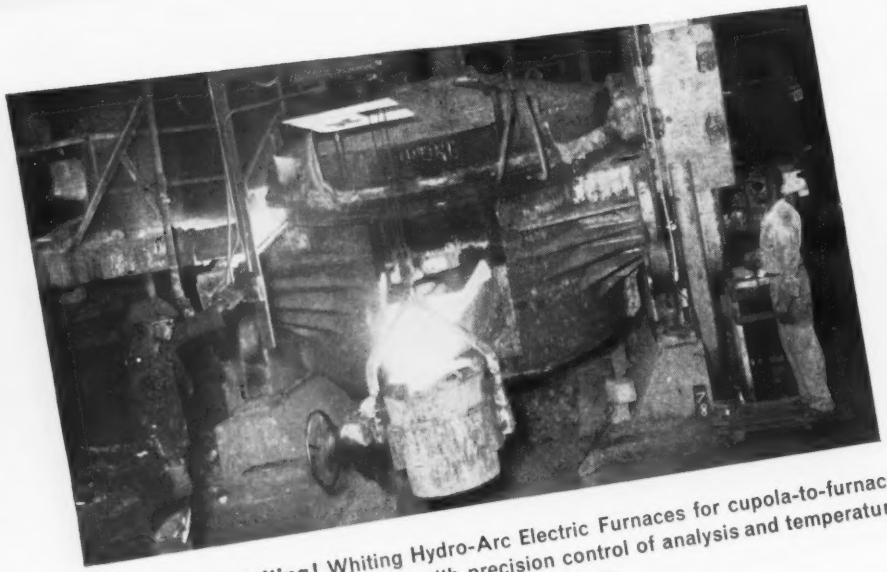

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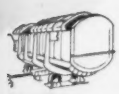
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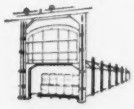
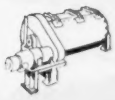

Annealing Ovens


Tumblers

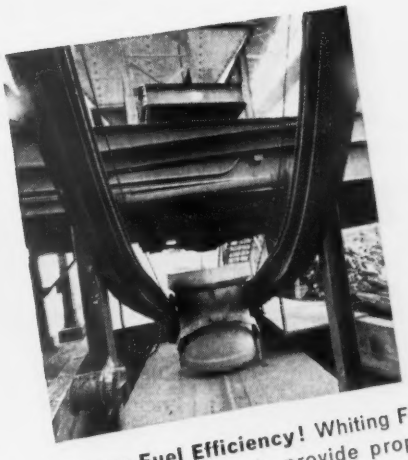
Electric Furnaces

Cupolas

Pulverizers

Ladles

Speed Charging Operations! Whiting Cranes are engineered to assure a smooth flow of materials from freight car to cupola. Whiting complete charging systems help cut costs and speed operations with greater manpower efficiency.



Increase Fuel Efficiency! Whiting Full Cone-Bottom Buckets provide proper distribution for better blast penetration and more efficient combustion . . . more melt with less fuel.

(*Concluded from page* 183)

The Stavely Co. developed production of centrifugally cast pipes in sand lined molds. Today the spun pipe has completely superseded vertically cast iron pressure pipe made in stationary molds. The present total capacity for centrifugally made cast iron pipes in Great Britain is 640,000 tons per annum. The centrifugal casting process has been adapted to the production of various other products.

Reference was also made in the lecture to the revival of the age-long lost wax process, or precision casting, for turbine blades of aircraft engines and for other parts, and to the development of shell molding.

Steel Castings—Quite large steel castings were made in England as far back as 1873, by Hadfields Ltd., which used batteries of crucible furnaces for melting. Then came the Tropenas type of bessemer converter. Just before the 1914-18 war, the electric arc furnace came into use, and by 1927 the high-frequency electric furnace melting plant was introduced. The rotary, pulverized fuel furnace also is still in use. Mention was made of the use of the oxygen "blow." The authors referred to the formation of the British Steel Founders' Association, which has contributed greatly to recent progress. Good use is made of alloying, and improved properties are such that in some cases steel castings are replacing forgings.

Foundry Equipment—Referring to molding machines, the authors mentioned that the first pneumatic ram jolting machine was imported from the United States in 1902. Progress and developments made since then in Great Britain were reviewed briefly, special mention being made of the magnetic molding machine, a purely British invention, and of the sandslinger.

Dealing with cupolas, they mentioned that by 1910 there was a reference to a drop bottom cupola, melting 50 tons per day, and various designs of tuyeres. Reference was made also to the hot blast cupola in the early 1920's, to the Poumay cupola in 1928, and later to the "balance blast" cupola developed by the British Cast Iron Research Association. Later came the use of basic linings and of water cooling; a demand for methods of continuous casting also developed.

A section of the paper is devoted to core bonds and to the use of chills and denseners. The remaining section deals with recruitment of personnel and the development of technical progress through the formation in 1920 of the British Cast Iron Research Association, a godchild of the Institute of British Foundrymen.

At the opening of the afternoon jubilee meeting, President Longden extended the greetings of the institute to prominent foreign visitors who had traveled from the Continent especially for the occasion. He mentioned in particular A. Brizon, president of the International Committee of Foundry Technical Associations and past president of the French Association; J. Goffart, president of the Belgian Association; and F. W. E. Spies, president of the Dutch Association and past president of the International Committee. He announced that Mr. Spies had been elected an honorary member of the institute, in recognition of his services to the industry and of his contribution to international activities in the foundry field.

The jubilee celebrations concluded with a banquet at which over 300 members and guests were present. President Longden announced a list of telegrams of congratulations received from the presidents of foreign foundry associations and of kindred associations at home and abroad. A cable was received from Collins L. Carter, president of the American Foundrymen's Society.

After the health of Her Majesty the Queen had been proposed by president Longden, the toast of "The Institute of British Foundrymen" was proposed by A. R. W. Low, Member of Parliament and parliamentary secretary, the Minister of Supply, and President Longden responded. Vincent V. Delport, European manager of FOUNDRY, speaking as representative of the American Foundrymen's Society, congratulated the institute and expressed the wishes of the society for the future progress of the institute.

Thus ended the first half-century of the Institute of British Foundrymen, now on its way to tackle the second half in full confidence of achieving further success.

Foundry Marks 15th Year

Texas Foundries Inc., Lufkin, Tex., recently marked its 15th anniversary of production with a birthday party for employees and their wives.

Meetings of Interest to Foundrymen

June 9-11—American Society for Quality Control, annual convention and exhibit, Hotel Jefferson, St. Louis

June 14-15—Malleable Founders' Society, annual meeting, Seigniory Club, Province of Quebec, Canada

June 14-18—American Society for Testing Materials, annual meeting, Hotels Sherman and Morrison, Chicago

June 20-23—National Metal Trades Association, ninth annual plant management conference, French Lick, Ind.

Sept. 13-20—Instrument Society of America, International Instrument Congress and Exposition, Convention Hall and Commercial Museum, Philadelphia

Sept. 21-23—Society for Experimental Stress Analysis, annual meeting and exhibition, in conjunction with first International Instrument Congress and Exposition, Bellevue-Stratford Hotel, Philadelphia

Sept. 27-28—Steel Founders' Society of America, fall meeting, the Greenbrier, White Sulphur Springs, W. Va.

Oct. 6-8—National Foundry Association, 56th annual meeting, La Salle Hotel, Chicago

Oct. 14-15—Michigan Regional Foundry Conference, University of Michigan, Ann Arbor, Mich.

Oct. 14-16—Foundry Equipment Manufacturers' Association, annual meeting, the Greenbrier, White Sulphur Springs, W. Va.

Oct. 18-22—National Safety Council, 42nd National Safety Congress and Exposition, Chicago

Oct. 27-29—Grinding Wheel Institute & Abrasive Grain Association, fall meeting, Edgewater Beach Hotel, Chicago

Oct. 28-29—Purdue Metals Casting Conference, Purdue University, Lafayette, Ind.

Nov. 1-5—American Society for Metals, National Metal Congress and Exposition, International Amphitheater, Chicago

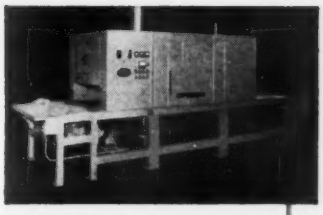
Nov. 11-12—Gray Iron Founders' Society, annual meeting, the Homestead, Hot Springs, Va.

Dec. 1-4—American Institute of Mining & Metallurgical Engineers, electric furnace steel conference, Hotel William Penn, Pittsburgh

1955

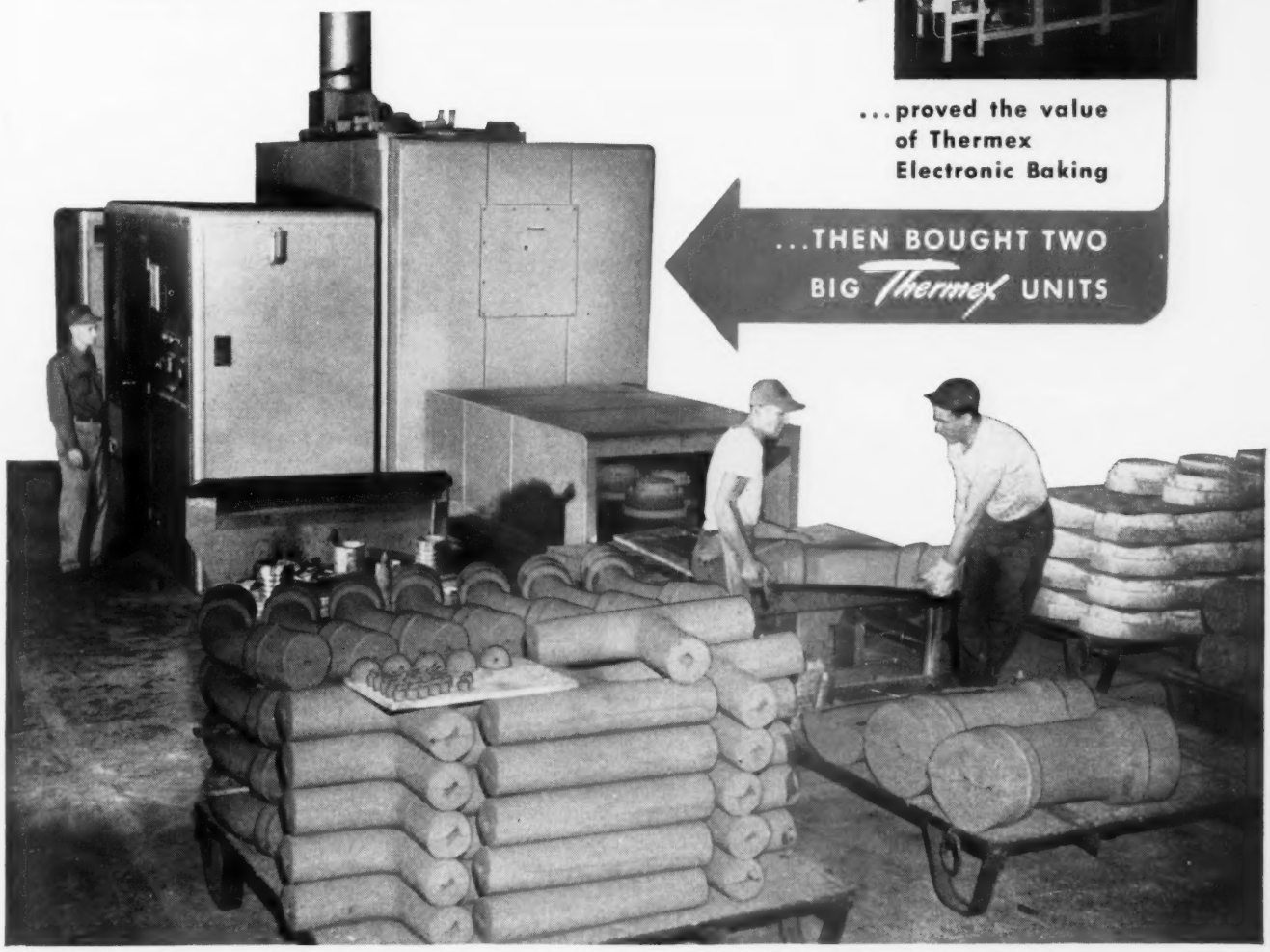
Mar. 28-Apr. 1—American Society for Metals, ninth Western Metal Congress and Western Metal Exposition, Pan-Pacific Auditorium, Los Angeles

THEY TRIED A SMALL *Thermex* UNIT



...proved the value of Thermex Electronic Baking

...THEN BOUGHT TWO BIG *Thermex* UNITS



Modernization cuts core room manhours 33%

"THE PROOF OF THE PUDDING" is in the heating at James B. Clow & Sons, Coshocton, Ohio. To prove the superior speed and quality of electronic core baking for pipe fittings, this progressive foundry installed a 15 KW Thermex unit three years ago. The results led them to modernize the core room and to make the mainstay of this streamlined operation two 60 KW Thermex Core Baking Units. This renovation has enabled Clow to reduce the core room crew from 24 to 16 . . . saving 8 men for other departments.

S. C. Clow, Chief Metallurgist, cites these advantages of core baking with the Thermex equipment:

1 Improves dimensional stability. Minimizes the sagging of cores.

2 Saves manhours. Cuts handling of cores and plates. Eliminates rod reinforcing of cores.

3 Reduces core loss due to breakage in pouring and handling.

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THERMEX DIVISION

Left to right, looking over the foundry's first product, are William Gavalik, rammer; E. A. Graham, foundry superintendent; R. E. Moughton, chief engineer; and J. W. Kinnear, general superintendent, Thomson Works

Modernizes Ingot Mold Foundry

By ROBERT M. LOVE
Pittsburgh Editor

THE rebuilt U. S. Steel gray iron foundry at the Edgar Thomson Works, Braddock, Pa., might be called "a completely modernized foundry." Extensive renovation of ingot mold production facilities begun in 1953 will be completed this fall.

Area of the new foundry upon completion will be 88,000 sq ft, an increase of about 20 per cent over that of the old one. Sections of the old foundry are being torn down to make way for the new. Roominess in the new foundry is indicated by dimensions of the casting shop, which is 100 ft wide. Distance from floor to roof truss is 60 ft.

When renovation of these facilities is finished, production capacity will be more than 250,000 tons of molds annually. Molds will weigh from 7800 to 60,000 lb. Entire output will be used to meet requirements of U. S. Steel plants in Pittsburgh and Youngstown. Pig iron for the foundry will be supplied from Edgar Thomson blast furnaces.

Task of keeping foundry operations going while rebuilding is in progress has taxed the ingenuity of U. S. Steel engineers. Railroad tracks were moved, for example, to enable production to continue during the transition from old to new facilities.

The main importance of the rebuilt foundry lies in innovations in equipment, layout and production techniques. E. A. Graham, foundry superintendent at the works, points out that the new equipment provides for greatest possible safety for workers, highest quality of product and economical operation.

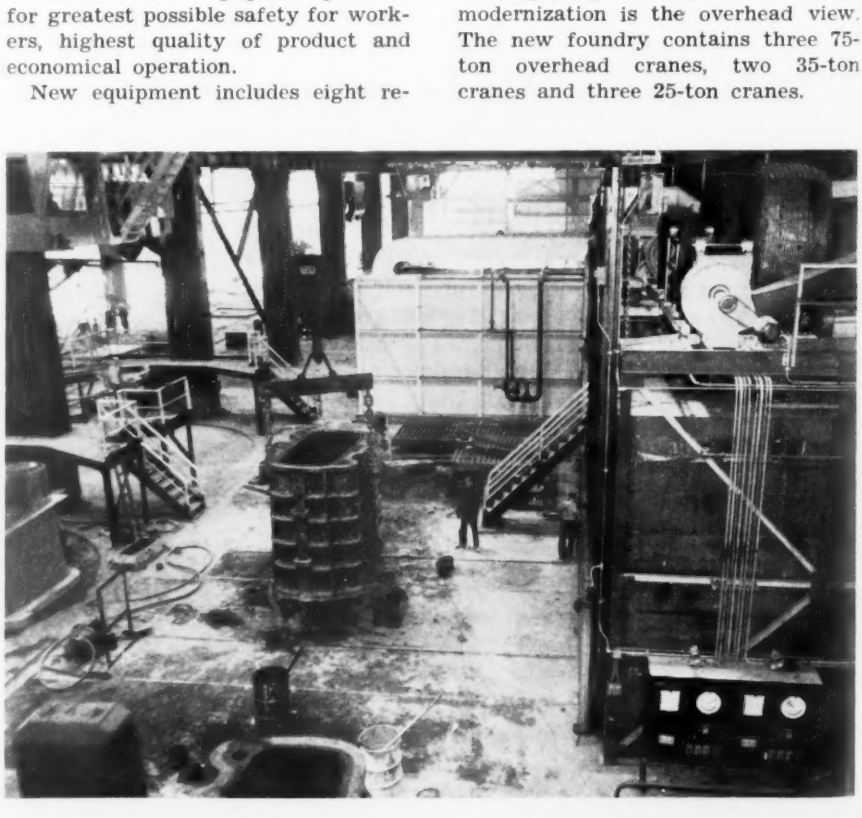
New equipment includes eight recirculating type drying ovens, sand preparation equipment and a pneumatic sand conveyor system. Two sandslingers are expected to provide superior, more uniform ramming and to save much time as compared to what was necessary previously.

Seven recently installed bins hold new sand, used returned sand and bonding agents used in sand preparation. Of these, two hold 50 tons each of new sand, one holds 200 tons of reclaimed sand, and each of the remaining four holds 25 cu ft of bonding materials. Prepared sand will be delivered to the ramming bay by a pneumatic conveyor. Belts will speed sand through cooling and screening processes. Foundry officials expect to reclaim as much as 90 per cent of sand used.

A new dust collection system provides a healthful atmosphere for safe and desirable working conditions. Dust collected passes through separators and then outside the foundry.

Among further new installations are three starter houses which hold electrical equipment for feeding various units. All new plant lighting operates on two circuits as a safeguard against a shutdown of the power supply.

Completing the picture of the modernization is the overhead view. The new foundry contains three 75-ton overhead cranes, two 35-ton cranes and three 25-ton cranes.



Oven building contains eight recirculating type drying ovens

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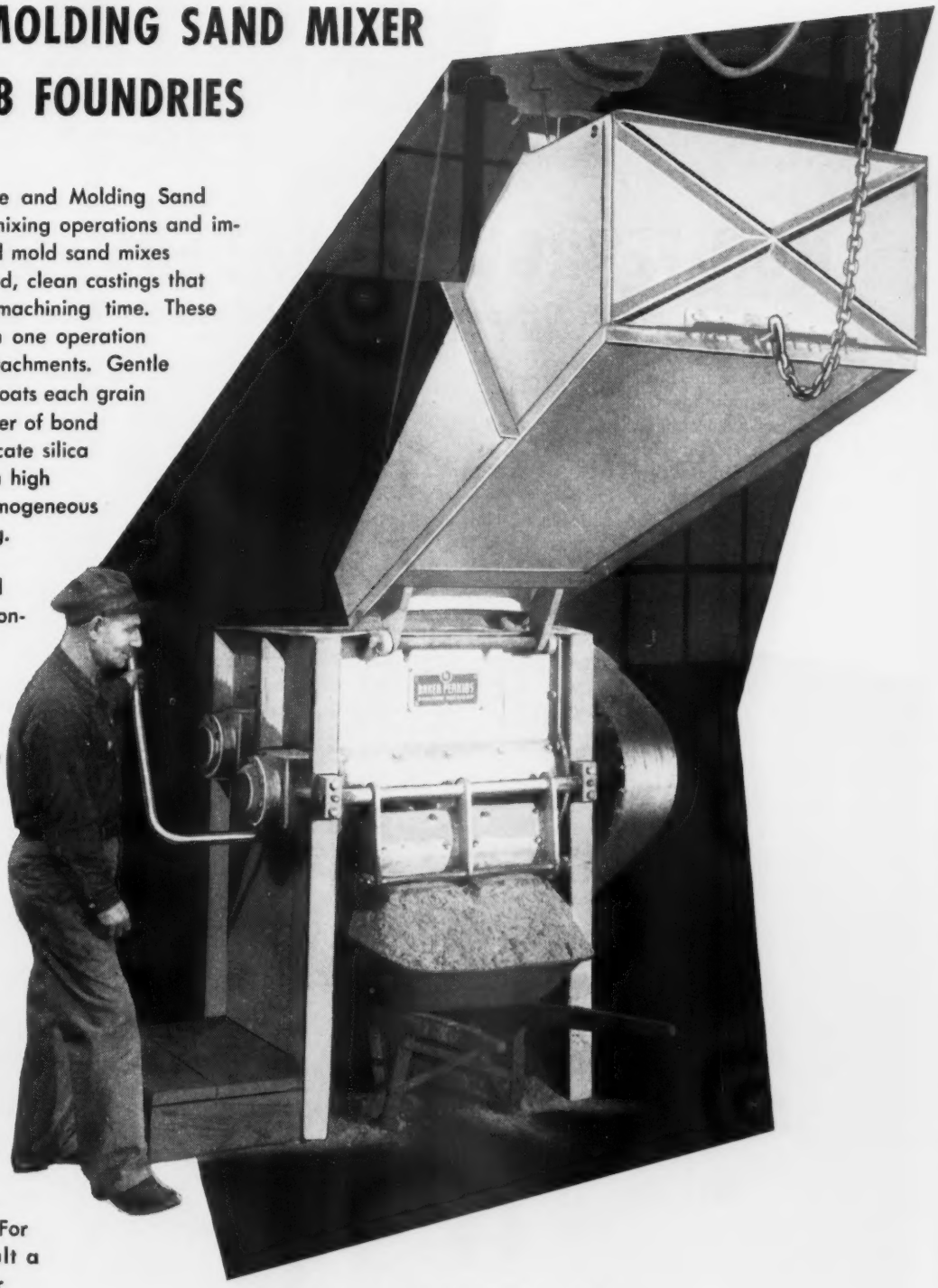

BAKER PERKINS Unidor Sand Mixers are strong and well constructed with a simplified operating mechanism that helps keep maintenance and operating costs low. The No. 14 Mixer shown here has a fabricated steel trough shell and cast iron ends, renewable steel liners, and cast steel Sigma blades with renewable wearing shoes of hardened steel. It has a working capacity of 5.5 cu. ft. BAKER PERKINS Unidor Mixers are available for job foundries in capacities up to 35 cu. ft. These models can be adapted to or equipped with air or electrically operated skip hoists. A laboratory model with a working capacity of 1500 to 2000 grams is also available. For complete information, consult a BAKER PERKINS sales engineer or write us today.

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JAMES W. WOLFE
Secretary-Treasurer

NON-FERROUS FOUNDERS' SOCIETY

Elects Officers At Annual Business Meeting

By WILLIAM G. GUDE
Managing Editor

ELEVENTH annual membership and business meeting of the Non-Ferrous Founders' Society was held at the Carter Hotel, Cleveland, May 9. Main features of the meeting were reports of officers and committees and election of officers and directors for the coming year. The society's annual dinner meeting was held the following evening, with more than 200 industry members in attendance.

H. A. White, Smeeth-Harwood Co., Chicago, who served the past year as first vice president, was elected president of the society to succeed Robert Langsenkamp, Langsenkamp-Wheeler Brass Works Inc., Indianapolis. Other officers chosen are: First vice president, William L. Leopold, Northern Bronze Corp., Philadelphia, and second vice president, Edward J. Metzger, Multi-Cast Corp., Wauseon, O. James W. Wolfe continues as secretary-treasurer. The following were elected directors for three-year terms:

Mr. White; John Lang, Standard Pattern & Foundry Co., Cincinnati; S. Oscar Swangren, Dorchester Brass & Aluminum Foundry Inc., Hyde Park, Mass.; Charles J. Egetter, Crown Brass Mfg. Co., Los Angeles; Norman M. Hanley, AAA Brass Foundry & Mfg. Co., San Francisco. Jake Dee, Dee Brass Foundry, Houston, Tex., was elected a director for a one-year period.

Mr. Langsenkamp presided at the general meeting session. Mr. Wolfe, reporting as secretary-treasurer, discussed briefly some of the activities of his office and indicated that the society is in excellent financial condition.

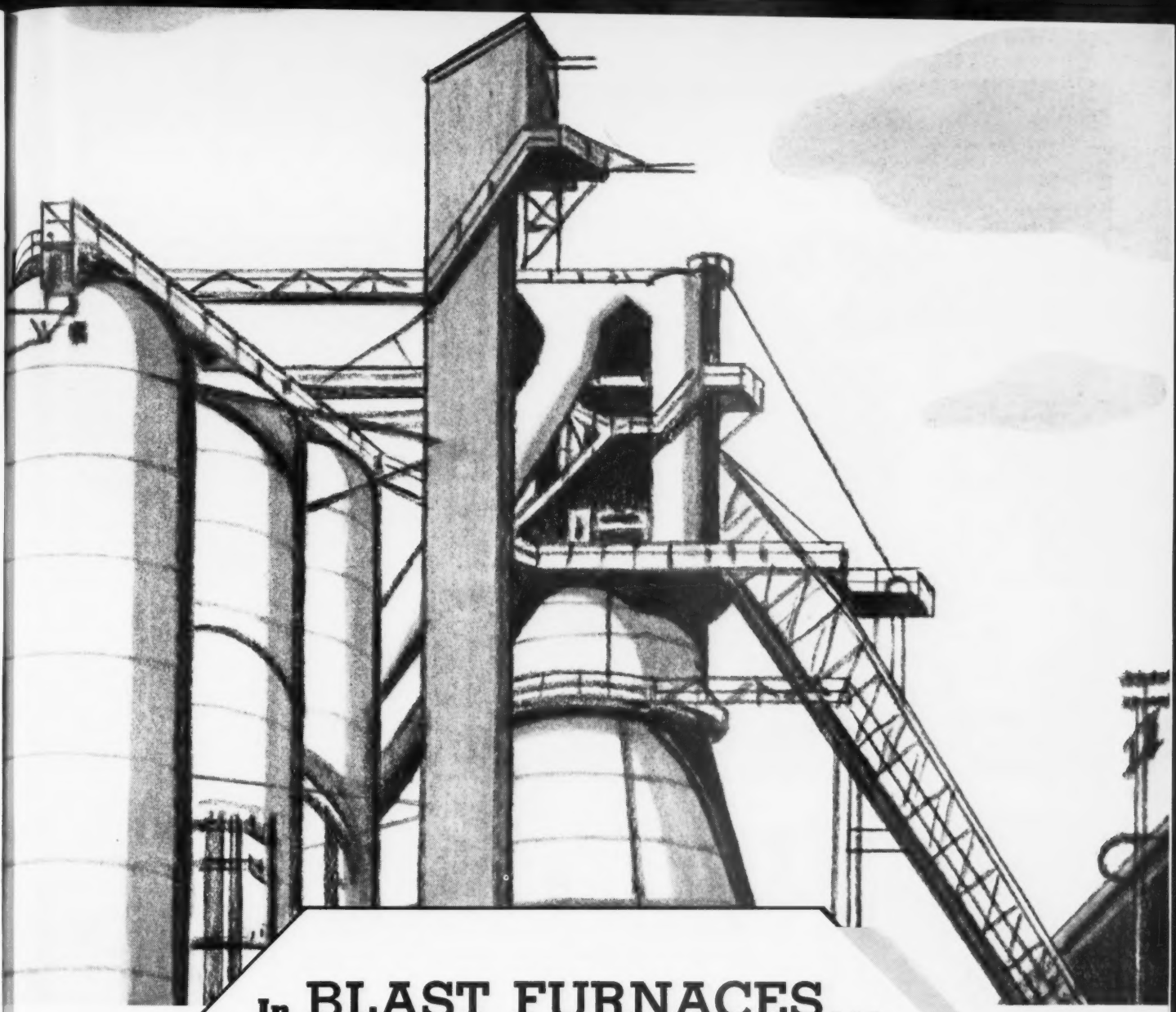
Walter M. Clark, D. W. Clark & Co., South Boston, Mass., reported on chapter activities and discussed benefits of chapter work.

H. A. White outlined plans for the group insurance program launched a short time ago. Thomas B. Belfield, Cochran Foundry Co., York, Pa., the society representative as trustee of the Foundry Educational Foundation, urged the active support of the society and individual foundries of the FEF work.

William L. Leopold, in reporting on

(*Concluded on page* 192)

More than 200 industry members attended the annual dinner meeting on Monday, May 10



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(*Concluded from page* 190)

membership activities, stated that 1[illegible] new members have joined the society since a year ago, bringing total membership to approximately 400.

The revised edition of the society's cost manual is completed and will be issued shortly, it was reported by William A. Gluntz, the Gluntz Brass & Aluminum Foundry Co., Cleveland. Mr. Gluntz also summarized the past activities of the society in cost work and urged that foundries keep their pricing formulas up to date in order to avoid some of the problems encountered during the last emergency period when price control was in effect.

Reporting on the Washington picture, Mr. Wolfe said that agitation for control of exports of nonferrous scrap so far have been without results. As a consequence, scrap prices have increased, with an adverse effect on the cost of nonferrous ingot. He indicated that no lower prices can be expected so long as exports continue at recent levels. Latest figures show that 23,000 tons of scrap were exported during January.

It was announced that a foundry facility survey of members would be taken immediately and copies of this survey are to be furnished to the Armed Forces and large prime contractors to facilitate placing of foundry orders.

William A. Meissner Jr., deputy director, Copper Branch, Business Defense and Services Administration, Washington, explained in detail the service which the BDSA is able to render, not only to industry during peace-time but also in the event of a national emergency.

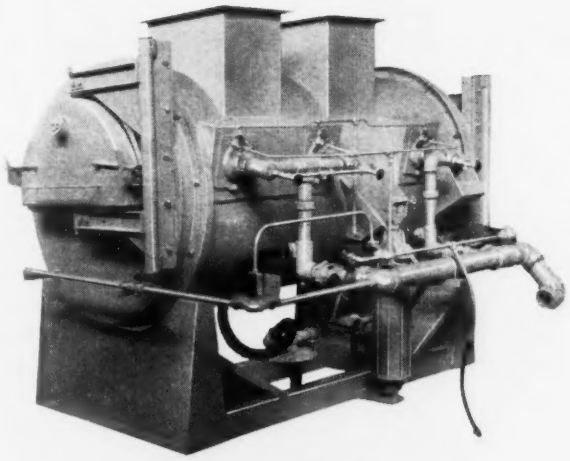
Alloy Steel Is Subject of Company Publication

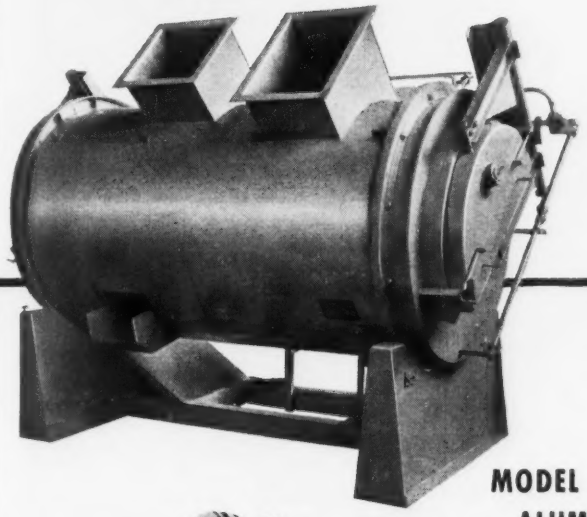
Through a 208-page book, *Alloy Steel Pays Off*, the Climax Molybdenum Co. presents 60 case histories compiled to show how others have profited from the use of alloy steels.

The facts and figures presented in these histories offer proof, according to the authors, of cumulative benefits through use of alloy steels of longer life, greater pay load, lower operating costs, greater safety and less maintenance. Authors also claim that there must be an economic reason for the widespread acceptance of any engineering material, and, in general, alloy steels are used only where they pay off in initial cost, in fabrication, in maintenance or elsewhere.

Copies of the book are available by writing on company letterhead to the Climax Molybdenum Co., New York 36.

Another Stroman 1st





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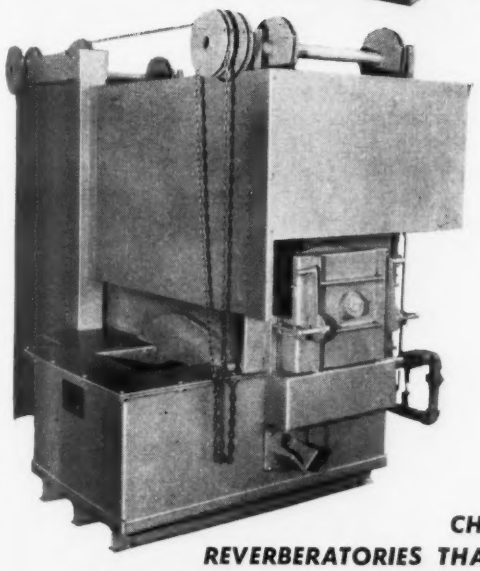

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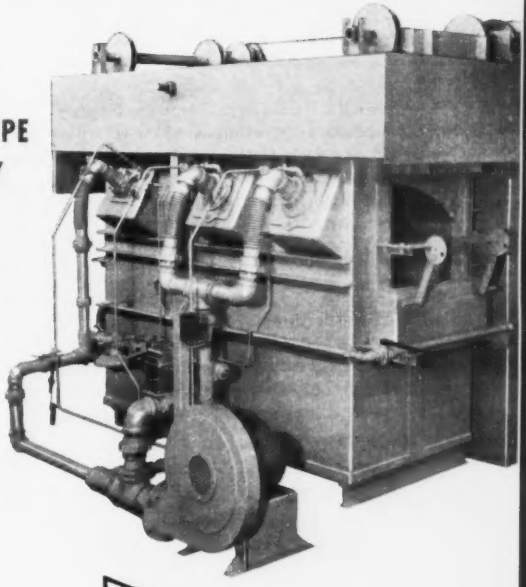

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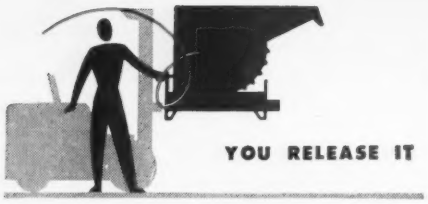

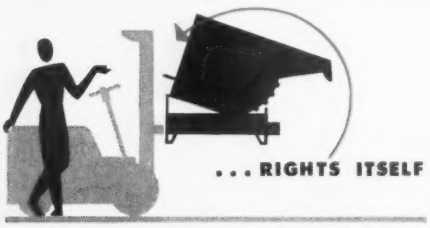

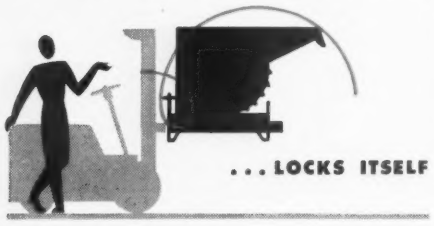

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OBITUARY

RALPH G. SWEENEY, 55, president and general manager, Allyne-Ryan Foundry Co., Cleveland, died Apr. 12. Mr. Sweeney entered the foundry industry immediately after his discharge in World War I, in which he served in the motor transport command. Starting as a timekeeper at Allyne-Ryan, he advanced to the office of purchasing agent and finally to the general managership and presidency of the company.

* * *

Raymond H. Gardner, chairman of the board of directors, Albion Malleable Iron Co., Albion, Mich., died Apr. 28. Mr. Gardner joined the company in 1905 as an apprentice molder. After 20 years in production work he served twice as company president—in 1937, and again from 1942-45. He has been chairman of the board since 1945.

* * *

Henry Duckworth, 82, retired vice president, Norton Co., Worcester, Mass., died Apr. 1 in Palm Beach, Fla. He had worked for the Norton Co. for more than 60 years and, in point of service, was the oldest retired employee.

* * *

F. W. Wilkening, 73, chairman of the board, Wilkening Mfg. Co., Philadelphia, maker of piston rings, died Apr. 21. Mr. Wilkening was president of the company for 31 years.

* * *

Karl M. Leute, president of Lithium Corp. of America Inc. and Manganese Chemical Corp., both of Minneapolis, died Mar. 24 while vacationing in Phoenix, Ariz.

* * *

G. T. Van Alstyne, 62, director of advertising-publicity, Air Reduction Co., New York, died Apr. 21. Mr. Van Alstyne joined the company's advertising department in 1919.

* * *

J. Harvey Byers, 73, president, Abrasive Products Co., Lansdowne, Pa., and vice president, Exolon Co., Tonawanda, N. Y., died Apr. 12.

* * *

Edgar F. Schaefer, 58, president, Gardner-Denver Co., Quincy, Ill., maker of compressors, pumps and drills, died May 2.

* * *

Valentine Fina, 72, president and treasurer, Milwaukee Valve Co., Milwaukee, died Mar. 30, following a year's illness.

* * *

Charles W. Staacke, 56, technical adviser, conveyor and belting sales, Hewitt-Robins Inc., died Apr. 9 while

(*Concluded on page* 196)

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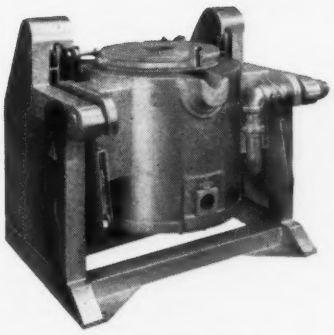


Lindberg-Fisher type MNP nose-pour tilting crucible furnace. Pouring lip is located in the axis of tilting providing a constant pouring arc regardless of degree of furnace tilt. Capacities up to #800 crucible with brass, up to #1000 crucible with aluminum. Oil or gas fired. Described in Bulletin 57-A.

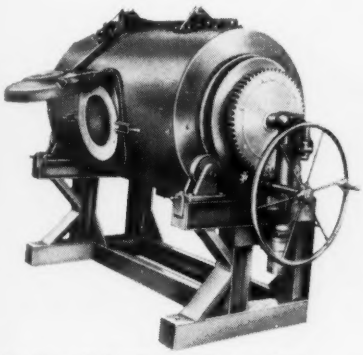
Lindberg-Fisher Electric Resistance Melting and Holding Furnace equipped with heavy duty resistance elements which give uniform distribution of heat, insuring long element and pot life. Capacities 250 to #1000 crucible.

For Non-Ferrous Metals

A complete line of

LINDBERG FISHER

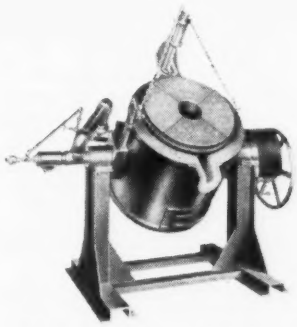
MELTING AND HOLDING FURNACES



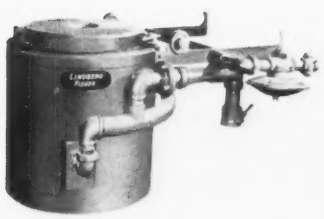
Lindberg-Fisher Simplex Rotary Open-Flame Furnace. Capacities to 2400 lbs. aluminum. 6000 lbs. brass. Oil or gas fired. Described in Bulletin 29-A.

For Melting Aluminum • brass • yellow brass bronze • copper • copper nickel alloys • lead magnesium • nickel • tin • zinc.

Because Lindberg-Fisher builds *all* kinds of melting equipment . . . gas . . . oil . . . electric . . . induction, and Carbon arc . . . L-F engineers are able to recommend, without prejudice, the proper type of furnace for *your* particular melting requirements.



Lindberg-Fisher type BB1 Hand-Tilt Crucible Furnace. Tilting mechanism consists of a hand wheel, driven through machined worm gear and pinion reducing gears. Capacities 50 to #400 crucible. Oil or gas fired. Described in Bulletin 400.



Lindberg-Fisher type SF stationary crucible furnace features rapid melting and is recommended for general foundry casting work. Capacities 30 to #400 crucible. Oil or gas fired. Described in Bulletin 301.

Melting specialists for 25 years

Sales and service offices in principal cities

LINDBERG FISHER **MELTING FURNACES**

A Division of Lindberg Engineering Company, 2453 West Hubbard Street • Chicago 12 • Illinois

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8 ways!
TOLEDO
NO SPRINGS HONEST WEIGHT
NEW...
8 choices of Dial Direction!
New Toledos provide utmost reading convenience for operator . . . help you control costs with greater *speed* and *accuracy*. On all new Toledos with swivel heads the dial can be installed to face any of eight directions in relation to the platform; also with full 360° swivel.
44 Ways Better . . . See the great new Toledo Industrial line . . . put it to work in guarding your costs better . . . faster. Write for bulletin 2001. Toledo Scale Co., Toledo 1, Ohio.
TOLEDO®
Today more than ever
HEADQUARTERS FOR SCALES

(*Concluded from page* 194)

in Detroit. He was the author of many technical articles on belting and had edited the belting sections of a number of engineering handbooks.

* * *

Walter E. Jewell, 76, founder of the former Jewell Steel & Malleable Co., Buffalo, died Apr. 8 at his home in Los Angeles. Mr. Jewell was president of the company until his retirement 30 years ago. Company name was subsequently Jewell Alloy & Malleable Co. and is now Kencroft Malleable Co.

* * *

Raymond A. Morris, vice president-secretary, Dominion Foundries & Steel Ltd., Hamilton, Ont., died Apr. 14.

Plant America Awards Are Open for Competition

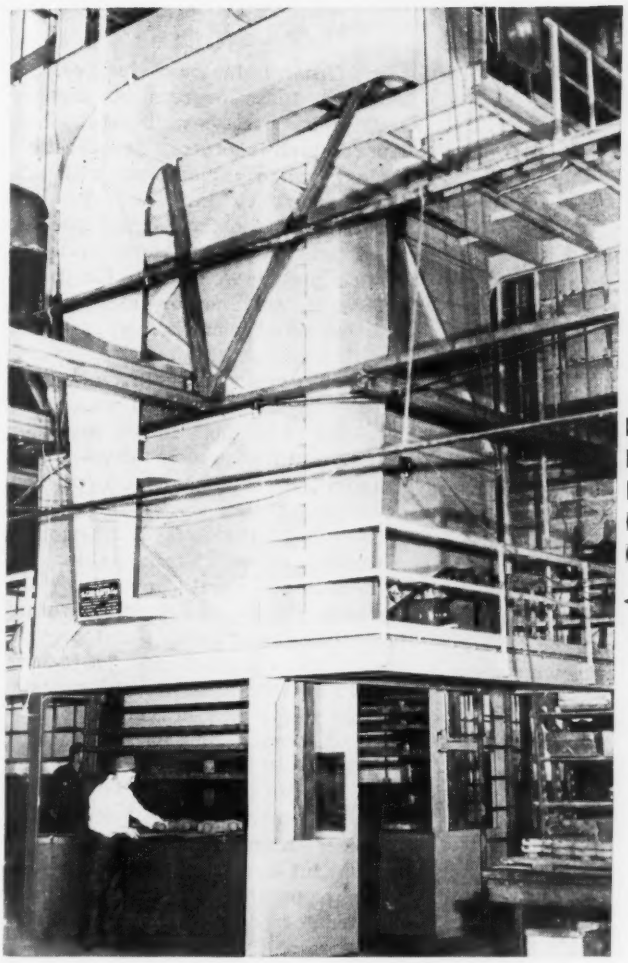
Competition for the 1955 annual Plant America contest, sponsored by the American Association of Nurserymen for industrial landscaping and beautification, will close on Sept. 1, 1954. Awards will be given in three industrial classifications: Manufacturing, service and institutions. Companies that have done an outstanding job in landscaping and beautifying their properties are invited by the association to enter the competition. In 1954, 14 national and 11 regional awards were given. The number of awards to be given in 1955 will be determined by the quality of the landscaping of those entered. Judges are leading industrialists, landscape architects, editors and educators. Contest rules may be obtained from the American Association of Nurserymen, 635 Southern Bldg., Washington 5, D. C.

British Society to Hold Conference in Glasgow

The fifty-first annual conference of the Institute of British Foundrymen will be held in Glasgow, Scotland, June 22-26. The conference is being organized by the Scottish Branch of the Institute. John Bell, secretary of that branch, will be installed as president of the institute during the conference. Technical sessions, lectures, plant visitations, an exchange paper from the AFS and the annual general meeting highlight the conference. A ladies' program has been arranged. An added feature will be an all-day boat trip on the Firth of Clyde.

CARL-MAYER

Important Development in VERTICAL CORE OVENS



HEAT FAN INSIDE OF OVEN

Recent installation of Carl-Mayer Vertical Core Oven with combination gas and oil fired recirculating heating system, at G. & C. Foundry Co., Sandusky, Ohio.

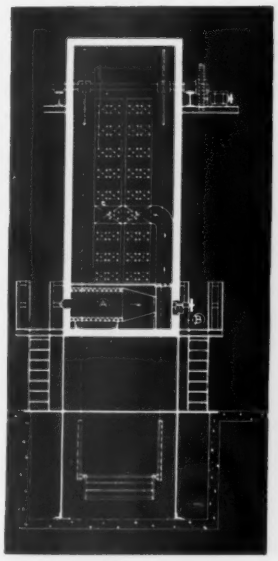


Fig. 1
NEW METHOD with heat fan inside oven. Patent No. 2,628,087.

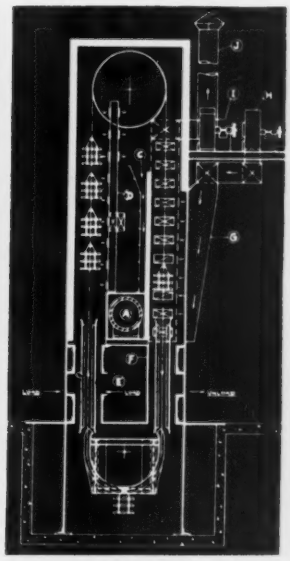


Fig. 2
Section showing conveyor travel thru pass, heating, cooling and exhaust system.

Vertical Ovens (Figs. 1 and 2) are by Carl-Mayer, using the universally adopted recirculating heating system with sealed combustion chamber located between the conveyor chains (Patent No. 2,257,180) and new method heat fan inside of oven (Patent No. 2,628,087).

A few of our Vertical Oven Customers:

Aluminum Co. of America
Ashland Malleable Iron Co.
Buick Motor Div. of General Motors Corp.
Cadillac Motor Div. of General Motors Corp.
Chevrolet Motor Div. of General Motors Corp.
Electric Autolite Co.
Ford Motor Co.
Fremont Foundry Co.
G. & C. Foundry Co.
General Steel Castings Co.
Ingersoll Steel & Disc Div. Borg-Warner Corp.
Richmond Radiator Co.
H. B. Salter Co.
Union Brass & Metal Mfg. Co.
West Michigan Steel Castings Co.
A. C. Williams Co.

Write for Bulletins No. 53-CM and HT-53

EXCLUSIVE HEATING SYSTEM *pays off several ways!*

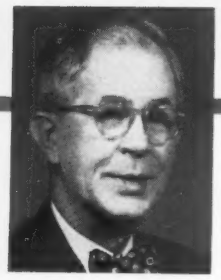
- Saves platform space.
- Eliminates external heat duct, reducing heat losses.
- Placing heat fan *in* oven also reduces heat losses, resulting in high operating efficiency.
- By eliminating external heat duct and fan insulation, it reduces installation cost.
- There is no smoke as from external heat ducts.
- Oven appearance is greatly improved.

Other important features contribute to faster baking, lower fuel consumption, smaller core losses, safer operation, elimination of smoke, cooled cores at unloading position and reduced labor cost.

THE CARL-MAYER CORPORATION

3030 Euclid Avenue • Cleveland, Ohio

BACKED BY REPUTATION AND OVER 30 YEARS' EXPERIENCE



MAN-TO-MAN

By RALPH L. LEE

Research in the Foundry Industry

"Having been sold on research, we should think now about the order and the degree of importance of the problems we want researched"

AFTER reading just about everything that has come my way regarding research on risers, runners, gates, shrink-bobs and such, I couldn't help thinking of a poem I often recite to myself:

The centipede was happy quite
Until a toad in fun
Said, "Pray, which leg goes after which?"
That worked her mind to such a pitch,
She lay distracted in a ditch,
Considering how to run.

Mrs. Edward Craster—1871

With a most profound respect for any and all research in the name of the foundry business and with sincere wishes for much more of it, I find that my biggest problem in reading all this risering dope is to try first to translate it into a foundry lingo I can understand and then to figure out just where this translation fits into my bungling efforts to make a few castings.

After going through all this, I couldn't help wondering whether, if molten metal could read and barely leafed through the volumes which have been written as to what happens as it goes swirling down into the bowels of a mold, whether it might not, like the centipede, sort of curdle up, "not knowing how to run."

Heaven only knows that anyone who has ever made and poured a mold wishes he knew a whole lot more about what goes on. But on the other hand, it seems to me that it wouldn't hurt researchers one bit to remember that every single casting in use today (millions and millions) is proof that molten metal did manage to gurgle on down through the imperfect holes, tubes and slits cut by ignorant foundrymen.

Just a short time ago I was talking to a group of fine young college men with splendid technical experience engaged in a most worth-while foundry research project. Knowing about the Lee Hobby Foundry and our Goldberg efforts to find out a few things, they seemed to feel quite free to tell me about what they were up to. While being enthusiastic right along with them, I couldn't help getting the impression that they were going about their work more or less in the role of evangelists bringing scientific light to foundry heathens.

Now I was brought up to believe that it takes a whole lot more than slide rules, microscopes, test tubes, interferometers and spectrographs to get the truth about Nature's forces. It also was drilled into me that some of the greatest contributions to science were made by men who were thrown into a floundering tizzy in the presence of algebraic formula, curves and the tailor-made lingo academic birds of a feather use while flocking together.

Certainly we will have to face the fact that practical foundrymen have been forced to carry on a continuous research project (rule of thumb though it may be) in their daily efforts to fill their orders according to customer specifications while avoiding just as much scrap as possible.

Few will care to deny that the results of this running research activity have been tremendous, that in fact they constitute the bulk of the information with which our foundries are being operated today. And with all due respect to the contributions of labeled science.

As in all research work (searching for the truth) we rarely are able to solve one problem without breeding one or more new ones. Naturally some of these offspring weigh more heavily than others; in fact, they range from immediate necessities to the mere satisfaction of curiosity.

Now the object of this rambling is to suggest that having been sold up to the eyebrows on the magic of scientific research, to the point of contributing sizable chunks of change to its support, we should put considerable thought into determining the order and degree of importance of the problems we want researched.

In General Motors (forgive the harping) these degrees of urgency have been pretty well established. The research laboratory devotes itself to long range exploration, with scientific curiosity in full play. One never knows the true significance of a particular bit of work, but the budget pretty well holds the reins.

Then there's another category, not quite so pure scientifically, in which the findings of the research group, together with those from other sources, are experimented with along the lines of possible future products. Manufacturing process development research as separate from product development also works along these lines. Then there is still another category, in which the tables are turned, so to speak; instead of the research findings determining future projects, immediate needs of product design and manufacturing procedures dictate specific research assignments.

Then to my way of thinking, probably the most important research activity of all is carried on by a group who, without smocks or any of the other trappings of the cult, gather together information (scientific or not) about the outstanding processes, tools, equipment and materials discovered or developed by different members of the GM family. The big thing to me about this activity is that the results of their findings are presented in a language that anyone involved will have no difficulty in understanding.

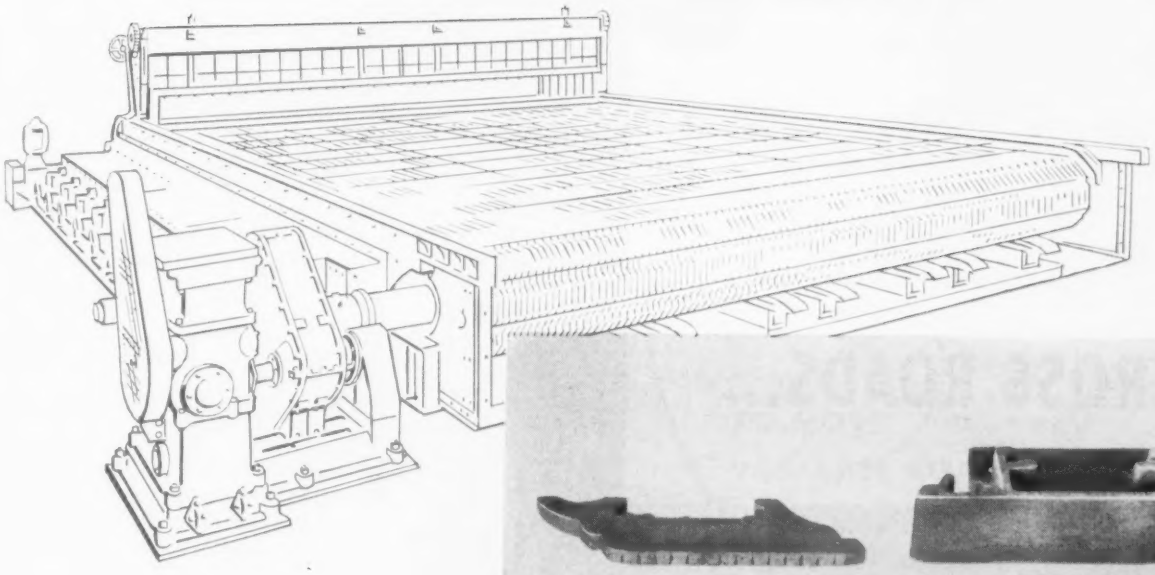
Since 80 per cent of the foundries which make up our industry are little fellows, who collectively turn out one whale of a lot of castings, I'd say, if I were planning the strategy of our research campaign, that our A1 category would be gathering together more of the things we already know about cast metal practices and learning how to present them in the language of the little fellow; that's a real research project in itself.

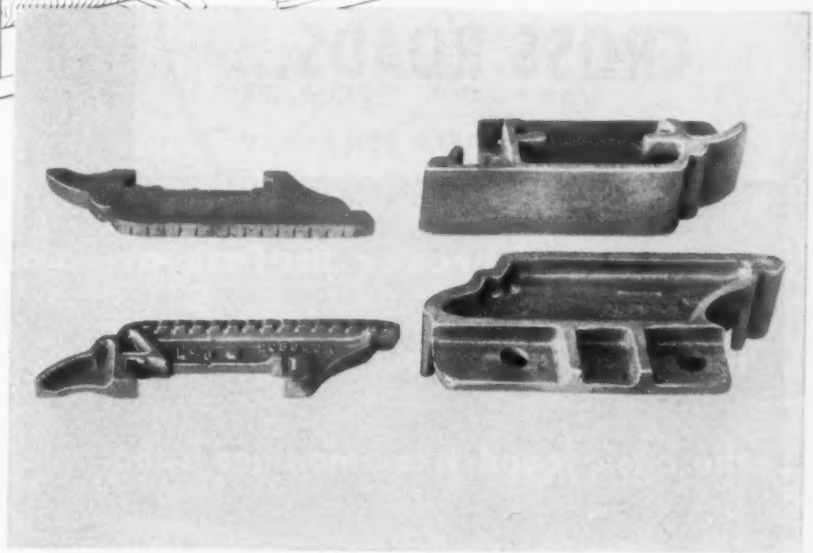
Next in order, I believe, would be to separate the highly speculative, exploratory, long-range research in our thinking from that designed to provide definite answers to pressing problems in our day-to-day operations and then to keep them both in economical proportions.

Next would be the recognition that researchers as a breed (and God bless

(*Continued on page* 200)

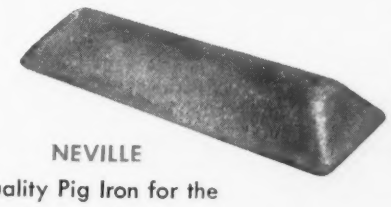
Combustion Engineering depends on Neville Pig Iron for Vital Stoker Castings





As a MAJOR producer of industrial boilers and stokers, Combustion Engineering, Inc., New York, N.Y., is called upon to tackle some of the world's biggest and toughest combustion jobs. For example, the company builds traveling grate stokers of the type illustrated above with grates as large as 26 ft. wide by 28 ft. long. For special applications, stokers as long as 60 ft. have been built.

The keys and other cast parts of the stokers must withstand constant heat, corrosion and abrasion. For this rugged service, castings must be exceptionally clean, sound and strong. For 25 years, the Monongahela, Pa. plant of Combustion Engineering has relied upon the quality and uniformity of NEVILLE Pig Iron for all types of gray iron parts. ● We invite you to call on NEVILLE Pig Iron to help you solve *your* special casting problems.



NEVILLE
Quality Pig Iron for the Foundry Trade

PIG IRON DIVISION
PITTSBURGH
COKE & CHEMICAL CO.
Grant Building · Pittsburgh 19, Pa.

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COAL CHEMICALS • AGRICULTURAL CHEMICALS • FINE CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

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in LARGE CITIES... SMALL TOWNS... CROSS ROADS...

. . . or wherever metals are cast

for fast "near-as-your-telephone-service" on the basic foundry commodities listed below.

GRIT	PIG IRON	FERROPHOSPHORUS
SHOT	DOLOMITE	REFRACTORIES
COKE	LIMESTONE	SAJCO JACKETS
COAL	FLUORSPAR	CUPOLA BED LIGHTER
CLAYS	SPIEGELEISEN	
SANDS	SILVERY IRON	BONDACTOR

REMEMBER:
ONE CALL GETS THEM ALL!

Hickman, Williams & Co.
(INCORPORATED)
CHICAGO · DETROIT · CINCINNATI · ST. LOUIS · NEW YORK
CLEVELAND · PHILADELPHIA · PITTSBURGH · INDIANAPOLIS
Established 1890

(Continued from page 198)

them) are usually so much in love with the act of researching and all of the trappings and traditions involved that they don't care too much as to what they research or what becomes of their findings. They need practical company and encouragement and considerable guidance with understanding.

Then finally, if it could be done without offense, I believe I would encourage researchers to keep in mind that one whale of a lot is known about thermodynamics, hydraulics, crystallization, kinetics, ceramics and the mechanics of molding and casting by the rank and file foundryman, even though he can't call them by their proper names or recite the formulas describing their characteristics and behavior. Then too it might be well for them to memorize Mrs. Craster's poem, "The Centipede."

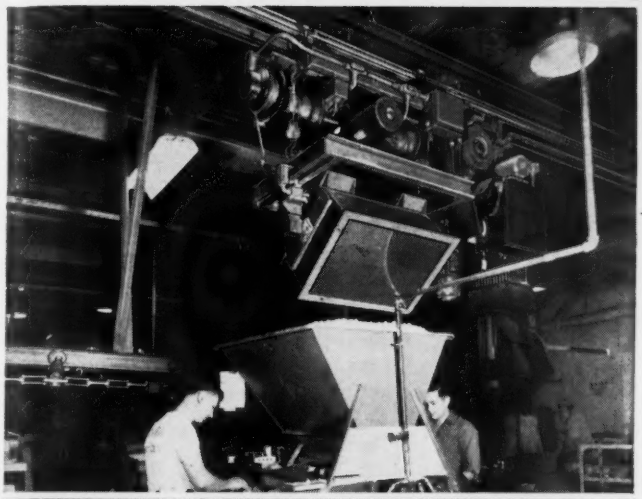
Blower Principle Remains Unchanged for Century

Roots-Connersville Blower, Division of Dresser Industries Inc., is celebrating this year the 100th anniversary of the discovery by the Roots brothers, Francis and Philander, of a principle for creating positive mass movement of gas and air that has remained basically unchanged since 1854. It was in that year that the first Roots industrial blower was made.

Over the years Roots engineers have been figuring ways to improve on the principle evolved by the Roots brothers a century ago. Improvements have been made in housings, bearings, mechanical details, and in metals contained in the machines, but none has been found for the principle of counter-revolving impellers machined to a tolerance that brings them close enough to carry air with minimum loss but not close enough to touch each other or the casing that houses them.

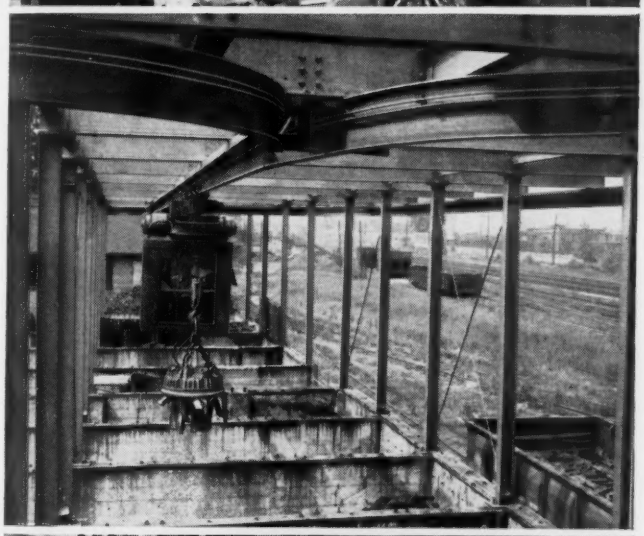
Although there have been several changes in company ownership since its formative days, the primary objective has been to build blowers. Six other products, all related to handling gas or air, have been developed. Today, in addition to the rotary positive blower, the company makes centrifugal blowers and exhausters, positive displacement meters, vacuum pumps, inert gas generators, and a spiraxial compressor. Many foundries and other industrial plants currently are using some or all of these types of equipment in their establishments.

what MONORAIL can do . . .



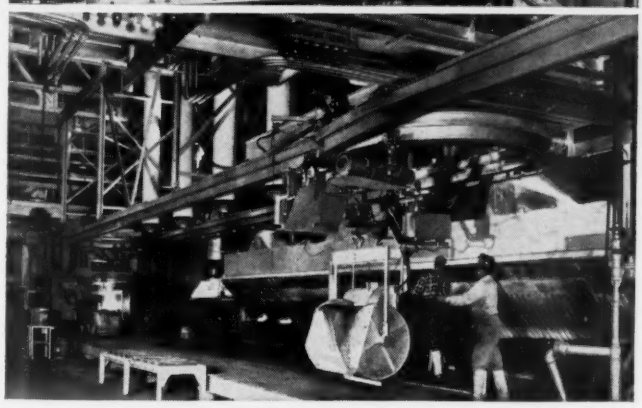
WHERE SPACE IS LIMITED

MonoRail relieves operating congestion by transferring materials handling to unused overhead area. Equipment can often be installed with no loss of production.



TO MOVE VARIABLE LOADS

Any size or shape of load, within the capacity of a MonoRail system, can be moved by using slings, grabs or other quickly changed "below the hook" devices for hand or electric operation.



FOR LOW MAINTENANCE COSTS

American MonoRail equipment is specially engineered and carefully built for long-life, rugged service. Manual or automatic operation continues with little or no downtime for maintenance or repair.

Send for Bulletin C-1 illustrating hundreds of successful MonoRail installations.

AMERICAN OVERHEAD HANDLING EQUIPMENT

MONORAIL COMPANY

13104 ATHENS AVENUE • CLEVELAND 7, OHIO

INDUSTRY BRIEFS

CLEVELAND Alloy Casting Co. and Castalloy Inc., 6111 Schaaf Rd., Cleveland, have been formed by George H. Phillips, sales representative for Kolcast Industries Inc., and R. A. J. Wellington, formerly vice president of Precision Metalsmiths Inc. Cleveland Alloy Casting Co. will produce heat, wear and corrosion resistant steel castings in sand molds. Castalloy Inc., the company's sales organization, also will be able to supply shell mold castings as well as investment castings from wax, polystyrene and mercury patterns.

* * *

Clark Equipment Co., Buchanan, Mich., has established a Ross Carrier Division for its Ross line of straddle carriers, which will be manufactured at Clark's Benton Harbor, Mich., plant and will continue to be marketed through the sales organization of the Clark Industrial Truck Division.

* * *

Tamms Industries Inc., Chicago, has appointed S. L. Abbot Co. to represent it in the San Francisco and Northern California areas. Abbot Co. has represented Tamms in Southern California for many years.

* * *

Herman Pneumatic Machine Co., Union Bank Building, Pittsburgh, has appointed Hewitt-McGrail Co., 4215 Graustark St., Houston, Tex., to be its representative in Texas, Louisiana and Arkansas.

* * *

Northwest Foundry & Furnace Co., 2345 Southeast Gladstone St., Portland 2, Oreg., has formed a new foundry division which will permit expansion of casting, sales and service facilities. Bruce E. Fitzwater will be manager and Harold E. Wainscott foreman.

* * *

Materials handling equipment manufacturing of Barrett-Cravens Co. now is in operation at its recently completed plant at 630 Dundee Rd., Northbrook, Ill., a Chicago suburb. Activities of two Chicago plants and of the company's Crescent Truck Division, previously at Lebanon, Pa., have been consolidated there. The new plant also houses all activities of Barrett Electronics Corp.

* * *

Perfect Patterns Inc., 3310 North Fiebrantz Ave., Milwaukee, has been formed with an authorized capital stock of 25,000 shares of common stock, par value $1 per share. Incorporators are Herbert W. Schmidt, Gordon J. Semrau, Robert W. Langenverg and Albert W. Kachel. Mr. Schmidt is the registered agent for the corporation.

* * *

Kaiser Steel Corp., Oakland, Calif., has added ferromanganese and silicomanganese to its line of products. Pioche Manganese Co., Salt Lake City, Utah, an associated company of Combined Metals Reduction Co., Salt Lake City, produces these alloys for Kaiser at a plant at Henderson, Nev. Production is at a monthly rated capacity of 2500 tons.

* * *

Pennsylvania Optical Co., Reading, Pa., has opened a branch office and warehouse at 1712 Taraval St., San Francisco. Donald H. Long has been named western division manager. Gordon E. Hadley will represent the company in southern California with headquarters in Los Angeles, and J. Robert Hottel will handle the northern California territory, working out of San Francisco.

* * *

Leeds & Northrup, Philadelphia, has moved its Cleveland office to 1922 East 107th St., from its former location in the B. F. Keith Bldg., 1621 Euclid Ave. D. E. Moats is manager. A. F. Moranty, with headquarters in Philadelphia, is regional manager. The company manufactures electrical measuring instruments, automatic controls, and heat-treating furnaces.

* * *

Lynchburg Foundry Co., Lynchburg, Va., has moved its general offices to the Courtland Bldg., Seventh & Court Sts., Lynchburg. The company, owners of the building, will occupy the fifth and sixth floors. The four lower floors will be occupied by other business tenants.

* * *

Southwestern Foundry Co. has begun construction of a new plant in Marshall, Tex., for the production of miscellaneous gray iron castings. Capitalization is $20,000. C. D. Rudolph, previously of Malvern, Ark., is president.

* * *

Industrial & Foundry Supply Co. of California, is the new corporate name of the former Industrial Foundry Supply Co. with offices at 1434 Howard St., San Francisco. Corporate officers will be: Charles R. Marshall, president; H. M. Riddle Jr.,

(*Concluded on page* 204)

MOVING DAY: After nearly 100 years of operation on the same site in Jersey City, N. J., E. A. Williams & Son Nonferrous Foundry, producer of both bronze and aluminum castings, has moved to a new plant in Carlstadt, N. J. Founded in 1857, the firm now is operated by the third and fourth generations of the same family. Shown above, in an architect's drawing, the new plant is 60 x 200 ft

the engineering excellence

that gave you HANDY SANDY and REDDY SANDY...

put the cost of sand conditioning and handling into a nose-dive for plants using this unique equipment. Without shoveling of any type, the Reddy Sandy separates sand from castings and cores and prepares it for the molder. Handy Sandy puts the sand overhead where it is available to the molder without effort. 30% to 70% production increases are commonplace. This same engineering excellence

...gives you better sand handling systems too

Complete Newaygo Sand Handling Systems exemplify this same type of creative engineering that lowers costs for you. They help produce more work from every foot of floor space and often eliminate several unnecessary operations that add to the cost of your castings but not to their quality. Newaygo systems take less time to install and erect as every unit is pre-assembled at the factory to save you time and money.

HOW TO SAVE MONEY THROUGH PLANNED MECHANIZATION

See how you can pay for your mechanization with the savings it makes. Send for the catalog "PLANNED MECHANIZATION FOR FOUNDRIES."

NEWAYGO | **engineering company**
NEWAYGO, MICHIGAN

Manufacturers of Neway® Mold Handling, Sand Handling and Conditioning Equipment

(*Continued from page* 202)

vice president; Lloyd Veitch, treasurer, and Francis T. Bookstaver, secretary. J. M. Kaney will be special field representative. In addition to the San Francisco address, the company will maintain warehouse stock at 1505 Wood St., Oakland, Calif.

* * *

Electric Controller & Mfg. Co., 2700 East 79th St., Cleveland 4, has contracted for construction of integrated plant and office buildings on a 27-acre site in southeast Cleveland. Completion is scheduled for spring, 1955, and when ready for occupancy all the company's Cleveland operations will move to the new location.

* * *

Classical Iron Works Inc., foundry, c/o Nicholas S. Maltese, 66 Court St., Brooklyn, N. Y., has been incorporated listing capital stock of 200 shares, no par value. Directors are Nicholas S. Maltese, 3225 Olinville Ave., Bronx, N. Y.; Anna Zekoll, 1716 Putnam Ave., Brooklyn; and Charles T. LaBella, 7909 Colonial Rd., Brooklyn.

* * *

Clark Equipment Co., Buchanan, Mich., has granted a sales and services franchise to Erie Industrial Trucks Inc., 1012 Liberty St., Erie, Pa. The new dealer's territory includes Erie, Crawford, Mercer, Venango, Warren, Forrest, McKean and Elk counties in Pennsylvania and Ashtabula and Trumbull counties in Ohio.

* * *

A. P. Green Fire Brick Co. of Texas, Houston, Tex., a subsidiary of A. P. Green Fire Brick Co., Mexico, Mo., has acquired Thermo Fire Brick Co., Sulphur Springs, Tex. Thermo manufactures a complete line of fire clay refractories. There have been no personnel changes.

* * *

Laurel Machine & Foundry Co., 810 Front St., Laurel, Miss., celebrated its 50th anniversary recently. The company manufactures custom-made machinery for saw mill, wall board, turpentine and rosin, and other industries.

* * *

Southern Illinois Foundry Co., Burrell St., R.F.D. #1, Carmi, Ill., subsidiary of Northwestern Stove Repair Co., Chicago, closed operations recently. No announcement has been made regarding future plans of the company.

* * *

Herron Stove & Foundry Co., 811 West Sixth St., Chattanooga 2, Tenn., has purchased the gas heater business and manufacturing facilities of the Inland Steel Container Division, Inland Steel Co., New Orleans, La., and will transfer production to Chattanooga.

* * *

SPO Inc., 7500 Grand Division Ave., Cleveland, has acquired the Multiplex Machinery Co., Elmore, O., manufacturer of concrete block production machinery. Equipment and operations will be moved to Cleveland and consolidated with SPO Inc. activities in the manufacture of molding machinery, vibrators and accessories.

* * *

Speedway Brass Foundry Inc., 36 West 44th St., New York, has been incorporated, listing 200 shares of capital stock at no par value. Directors are Rae Hordes, Herbert Kreisberg and David Greenstein, all of the above address. Papers were filed by John J. Diamond, same address.

* * *

Leschen Wire Rope Division, H. K. Porter Co., St. Louis, will construct a modern, air-conditioned, one-story headquarters office on the company's property at 2725 Hamilton Ave. This is the latest step in the firm's modernization program started eight months ago.

* * *

Gibney-Coffman Corp., 2107 Kensington Ave., Buffalo, has changed its name to Gibney-Decot Corp. Val Decot will be vice president of the company, which represents a number of organizations, including foundries, in western and central New York.

* * *

Thor Power Tool Co., Aurora, Ill., has purchased Speedway Mfg. Co., Chicago, producer of low-priced electric tools. To be known as Thor's Speedway Mfg. Division, Speedway will continue with the same personnel and executive management.

* * *

Lichtenberger Bros., 2715 West Lake St., Chicago, have been named distributors of Cleco air tools, manufactured by Cleco Pneumatic Tool Division, Reed Roller Bit Co., Houston, Tex.

* * *

New England Die Casting Co., has completed an addition to its plant in West Haven, Conn. New structure provides 17,000 sq ft for packing, shipping and aluminum casting production.

* * *

S. G. Taylor Chain Co., Hammond, Ind., has opened a new plant in Pittsburgh, offering a complete stock of carbon and alloy steel chains.

* * *

Thompson & Johnson Equipment Co., 1898 Erie Blvd. East, Syracuse, N. Y., has been appointed to sell and

(*Concluded on page* 206)

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Asbury, New Jersey

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G. W. Bryant Core Sands, Inc.
McConnellsville, New York

Stoller Chemical Company
Akron 2, Ohio

La Grand Industrial Supply Co.
Portland 1, Oregon

Pennsylvania Foundry Supply &
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Philadelphia 24, Pennsylvania

Robbins & Bohr
Chattanooga, Tennessee

Carl F. Miller & Co., Inc.
Seattle 4, Washington

Interstate Supply & Equipment Co.
Milwaukee 4, Wisconsin

Canadian Foundry Supplies &
Equipment, Ltd.
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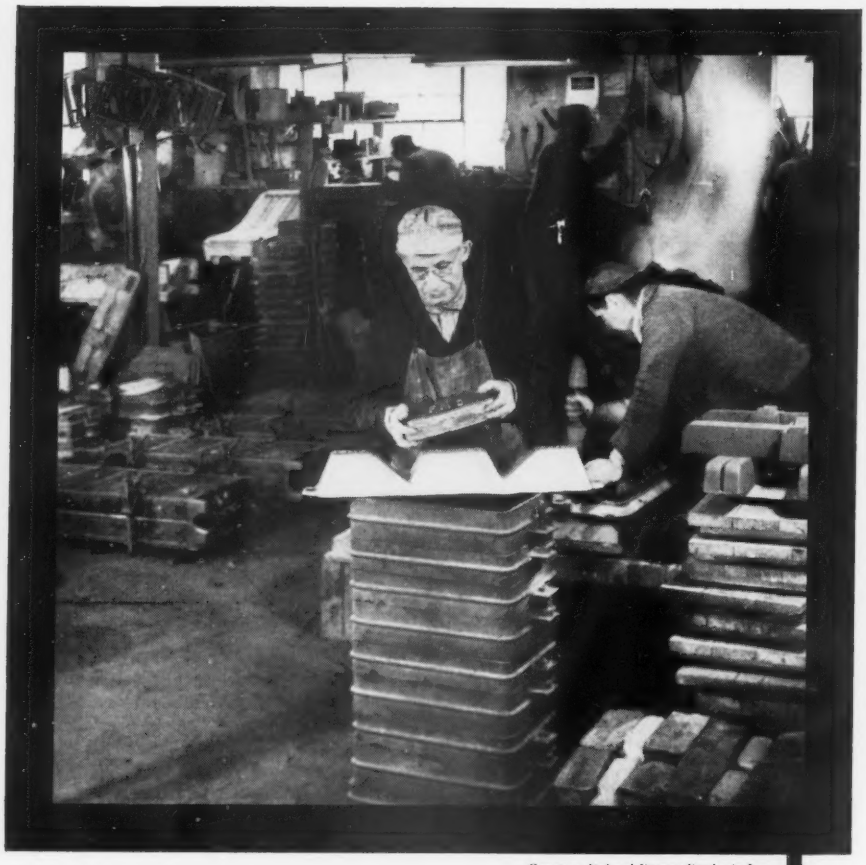

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(*Concluded from page 204*)

service industrial fork-lift trucks and other materials handling equipment manufactured by Clark Equipment Co.

* * *

American MonoRail Co., 13107 Athens Ave., Cleveland 7, has opened a branch office at 244 Water St., Akron 8, O. Jack Lamprecht will be in charge of engineering sales service from the new office.

* * *

ElectroLift Inc., has combined its sales, engineering and manufacturing facilities in a new and expanded plant at 204 Sargeant Ave., Clifton, N. J. The company manufactures worm-drive, electric lift hoists.

Wheelabrator Establishes College Scholarships

American Wheelabrator & Equipment Corp., Mishawaka, Ind., will sponsor through the Wheelabrator Foundation Inc., annual scholarships for sons of company employees. The scholarships, to be known as the Verne E. Minich Founder Scholarship to Purdue University and the Otto A. Pfaff Scholarship to the University of Notre Dame, also are available to male employees of the company under the age of 25.

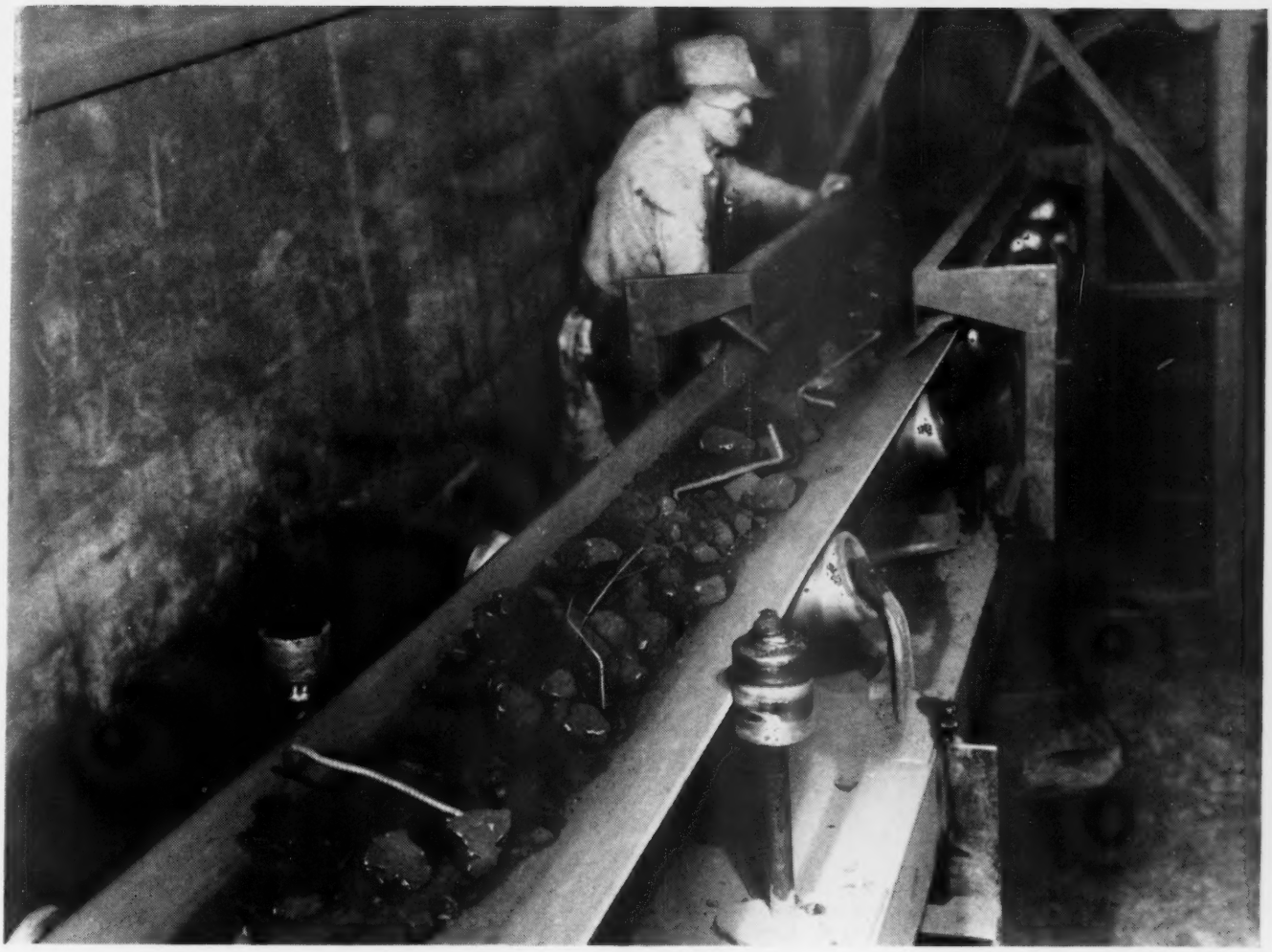
One scholarship to each university will be awarded annually, with initial awards and annual renewals thereafter in the sum of $650. Beginning with the fourth year, eight students will be receiving scholarship benefits each year.

The prescribed courses for the Minich scholarship are engineering and physical sciences. Those for the Pfaff scholarship are engineering, physical sciences and commerce.

Awards will be based on selections made by scholarship committees of Purdue and Notre Dame.

Electrodes for Welding

Five types of copper and copper-alloy, covered and bare, electrodes are prescribed in the new edition of the Tentative Specifications for Copper and Copper-alloy Welding Electrodes issued jointly by the American Society for Testing Materials and the American Welding Society (ASTM Designation B 225; AWS Designation A 5.6). Filler metals include copper, copper-silicon, copper-tin, copper-nickel and aluminum bronze. Copies of the specification can be obtained for 25 cents each from American Society for Testing Materials, 1916 Race St., Philadelphia 3, or American Welding Society, 33 West 39th St., New York 18.



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At close intervals throughout its length, transverse groups of high-tensile steel wires are built into the belt's carcass. When a sharp, partly-embedded object starts to rip this belt, it quickly encounters one of these wire groups. Immediately it is ejected...and damage to the belt is confined to a very short section, only inches in length!

In field tests during the past five years, RESISTORIP belting has amply demonstrated its ability to outlast as many as three, four, or more, ordinary shake-out belts.

If you're tired of buying new belts every few months, see your local NYB&P distributor and have a RESISTORIP belt ready for your next emergency replacement! Write or phone PRescott 7-6940, Passaic, N. J., for your distributor's name and address.

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Test Bars

(*Continued from page* 101)

must be such that only metal quality is being tested. To accomplish this end, the tensile test coupons should be (1) free of porosity due to shrinkage or dissolved gases, (2) free of inclusions introduced by manufacture, such as oxides trapped by turbulent pouring or gating and (3) free, as much as possible, of the influence of the mold in which the test bar casting is made. Factors involved in the production of top quality test bars (so that metal quality itself can be safely judged) are design of the pattern by which the coupon is cast, foundry practice used (gating, molding, etc.) and manner in which the metal is melted and cast into the test bar mold.

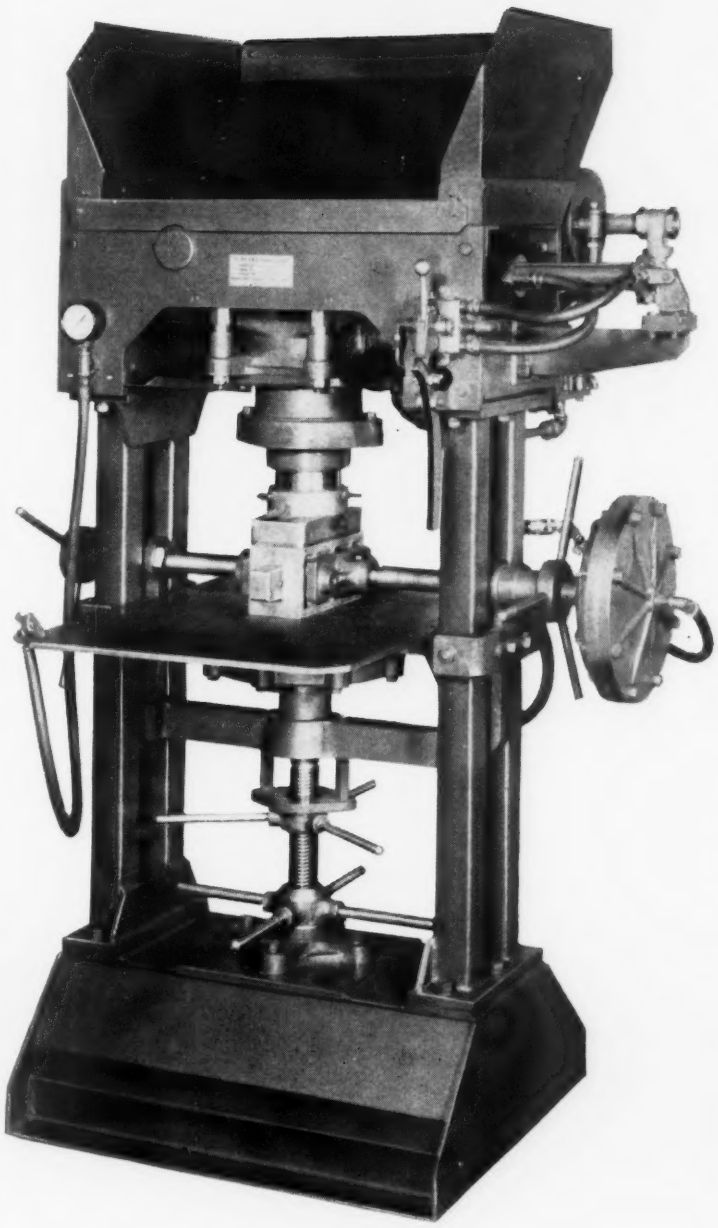
In general, test bar designs for copper-base alloys are divided into two groups. The first is for the so-called "high shrinkage" or short-freezing range alloys such as manganese bronze and aluminum bronze. The second category is the alloys of longer freezing range and more uniformly dispersed shrinkage, such as the tin bronzes and the leaded tin bronzes. The "amount" of shrinkage in an alloy is not a safe criterion for separating the various alloys since this actually does not determine the most suitable test bar design. The distribution of shrinkage is a more accurate method of classification, as will be seen later.

Short Freezing Range Alloys—The best known members of this group are the previously mentioned manganese and aluminum bronzes. These alloys freeze much as do pure metals, with a sudden change from liquid to solid, resulting in concentration of shrinkage into pockets, or "pipes." The shrinkage cavities usually are found in the last metal to freeze, more or less limited in location, leaving the balance of the casting, or metal, sound and free of this type of porosity. Test bar coupons for these alloys require an adequate riser or head to concentrate shrinkage away from the coupon itself. If this is done, the sound test bar requirement can be met satisfactorily.

To accomplish the casting of a sound, shrinkage-free coupon from alloys of the short-freezing range type, the conventionally accepted design is the keel block or double keel block illustrated in Fig. 2. This is essentially a uniform cross section block from which the tensile bar is machined, with a large riser or reservoir of hot metal available to insure adequate feeding of the coupon section. The riser is large enough

(*Continued on page* 210)

Redford NO. 4 CORE BLOWER



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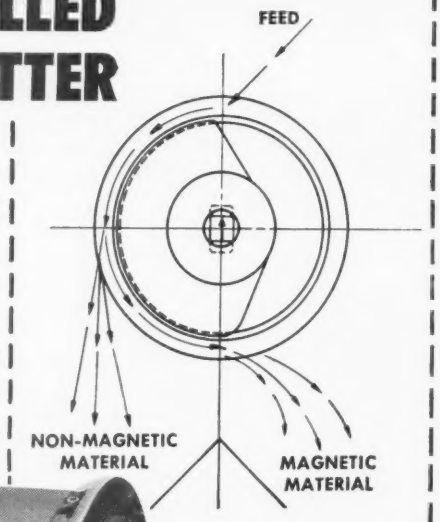

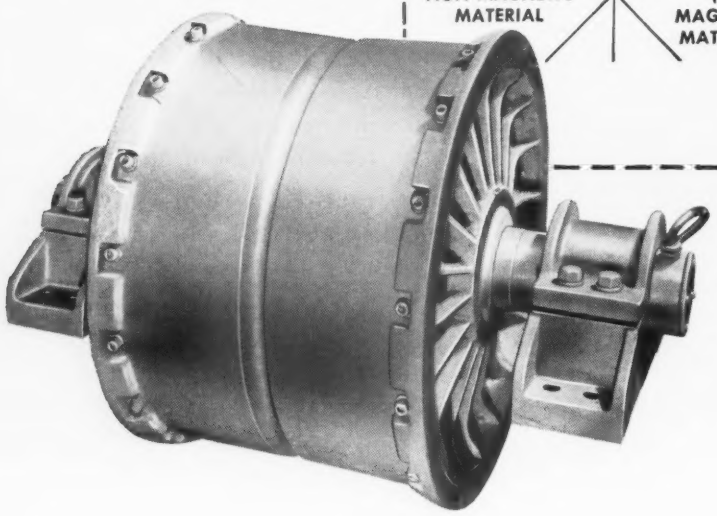

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(*Continued from page* 208)

so that any shrinkage cavity or pipe will not extend through to the coupon portion of the bar. That the feeding is adequate can be seen from the fact that two tensile bars can be machined from one leg of the lower section (one bar above the other) with no change in measured results.

Long Freezing Range Alloys—Most of the commonly used bronzes—85-5-5-5, Navy "G" (88-8-4), silicon bronzes, etc.—fit in this category. These are alloys that freeze over a range of temperatures so that the solidification shrinkage is distributed throughout most of the casting rather than concentrated, as in the other class of alloys. The problem of producing sound test bars is greatly complicated here by the wide variety of alloys involved, with a wide range of freezing ranges. Consequently, there is much less agreement as to what constitutes a satisfactory test bar design. Much work has been done over a long period of years, and by evolution and gradual modification two separate solutions to the problem have been proposed.

1. *Machined Test Bars*—The tensile bar casting designs in this group have been recommended by American Society for Testing Materials, Society of Automotive Engineers, etc., and are required by the Navy, the Department of Defense and others. They are by far the most widely used, and, also, the most troublesome. The simplified design popularly used is illustrated in Fig. 3 and is known as the 5/16-in. Webbert bar, or vertical full web bar. It is essentially an oversize tensile bar (with machining allowances) provided with a substantial riser over its entire length, with riser attached to bar by a 5/16-in. Web. The basic design of the bar has fairly general acceptance, but numerous modifications of the design have been made to facilitate manufacture. This bar always is machined to final dimension, a process which removes the as-cast skin, the soundest portion of the casting.

Some of the more common variations of the basic Webbert bar are shown in Figs. 4, 5, 6 and 6A. The design in Fig. 4 is merely two bars cast at one time since normally it is desirable to have a duplicate of each test. Fig. 5 is a modification made to permit mounting of the pattern on a matchplate. Notice here that the bar and riser have been laid on a side with an additional riser added to the top to give better feeding. Figs. 6 and 6A show still another treatment of the basic design.

2. *Cast-to-Size Bars*—One of the most reasonable objections to the

(*Continued on page* 212)

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(*Continued from page* 210)

Webbert bar described above is the fact that it must be completely machined, to rather close tolerances, before it is acceptable. This step requires not only considerable expense, but also delays the tensile test and holds up acceptance and use of castings. The high machining cost of tensile bars also becomes a factor in casting alloy research.

To deal with this problem there has been growing interest in tensile test coupons that can be broken without machining; that is, in the as-cast form. Various suitable designs have been proposed, but only one type has achieved much formal recognition. The ASTM has recommended use of the LTB-1 bar, shown in Fig. 7 with gating system, as an alternate choice to the regular Webbert bar of Fig. 3. With careful foundry practice it is possible to produce bars that will give reproducible results. Since the presence of the casting skin is beneficial, quite satisfactory results can be obtained. One objection to this particular bar is the rather large amount of metal it requires. To make two bars 35 lb of bronze must be poured.

Another cast-to-size bar that gives surprisingly good tensile values is the so-called "aluminum two-bar" design shown in Fig. 8. This pattern is widely used for aluminum, with excellent results. It produces two bars of satisfactory dimensional accuracy in bronze with about 15-20 lb of metal. To insure feeding, it often is necessary to increase the thickness of the chocked section of the gate when copper alloys are cast. So far no formal recognition has been made of this design, although it has been used for a variety of alloys where specifications permitted.

Considerable work is in progress on designing an as-cast bar that will be universally acceptable. A number of designs are in test, and it is entirely possible that in a relatively short time in the future cast-to-size test bars for bronze will be a part of all major specifications. Much research and validation must be done, however, by foundries operating under varying conditions, before any design is considered acceptable as a working tool.

Foundry Practice—Production of good test bars requires good foundry practice. The very nature of the test indicates the need for standard methods of manufacture so that *only* metal quality is measured. Unless this is the case, it is almost impossible to be certain whether a test bar failure is due to low metal quality or to poor foundry practice.

(*Continued on page* 215)

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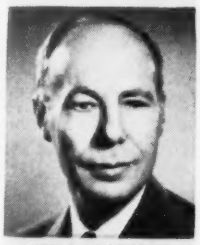

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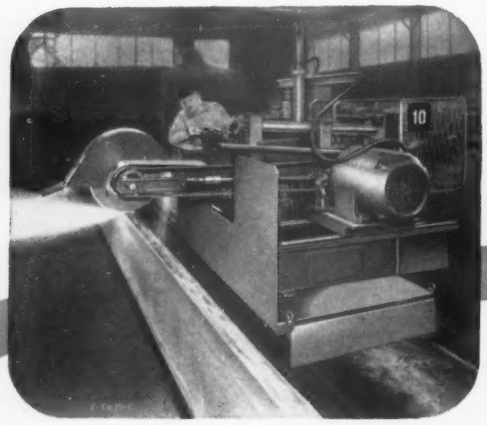

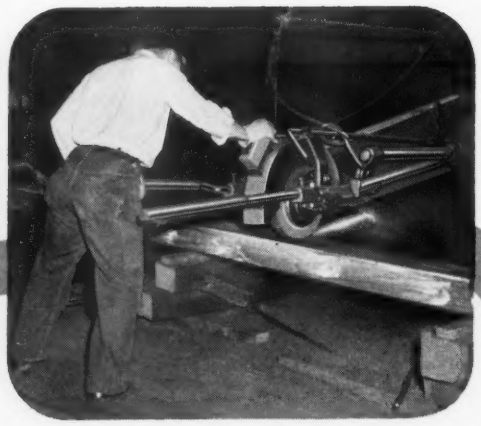

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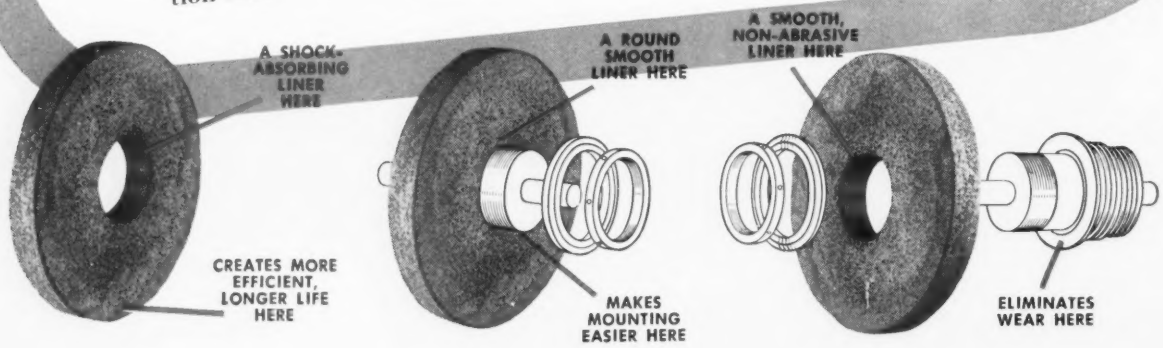
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(*Concluded from page* 212)

In the following discussion factors other than preparation of the metal will be considered.

1. *Keel Block*—Rather fortunately for nonferrous foundrymen, the making of satisfactory test bars with a keel block pattern is not too difficult. Gating and pouring temperatures do not in themselves seem critical. Although it is desirable to have both manganese and aluminum bronzes enter the mold in a nonturbulent fashion, satisfactory results often can be obtained by pouring directly into the mold cavity. Since the keel block should be molded with an open cope, direct pouring is easily accomplished.

To obtain the very best results with test bars of this type, it is advisable to use a streamlined gating system such as shown in Figs. 9 and 10. This introduces the metal into the cavity quietly, avoiding splashing and consequent production of dross. The ingate can enter either at the bottom of the cavity or preferably, into the riser just above the coupon level. Some gating systems provide for an overflow which feeds the top of the riser directly with hot metal.

Mold material does not seem to be critical with keel blocks; green sand, oil bonded core sand or combinations of both can be used with good results. Two-part flasks usually are employed, sometimes with a core, to facilitate gating.

An extremely useful step in keel block practice is to make use of either an insulating material such as powdered gypsum or rice hulls or one of the exothermic compounds available for copper-base alloys. Since either material will keep the riser metal liquid, thorough feeding of the coupon portion of the keel block is more likely.

Pouring temperature is not a critical variable in itself in the production of keel blocks with manganese and aluminum bronzes. Considerable data exist indicating that good test bar properties are obtainable over a wide pouring temperature range. For sound metallurgical reasons, however, it is desirable to control the pouring temperature. Specific recommendations are given in Table I and discussed later. Sufficient to say, internal soundness because of shrinkage is not greatly affected by variations in pouring temperature.

2. *Webbert Bars*—Every factor operative in the manufacture of any casting is greatly emphasized in making tensile test bars of tin bronzes and leaded tin bronzes. Mold material, gating systems and pouring temperature all are critical in production of good Webbert bars. Adequate gating of any tin bronze casting is important; in making a test bar it is essential that every provision be made for an adequate supply of hot metal carried into the mold cavity quietly and nonturbulently.

One method of gating designed to accomplish this is shown in Fig. 4. This method, recommended by ASTM, makes use of the most up-to-date knowledge available on metal flow. Regardless of what gating system is used with a Webbert bar, the gate should be into the riser rather than into the coupon itself, with some type of choke used to avoid dropping the metal down the sprue and directly into the mold cavity.

When the Webbert bar is mounted on a matchplate, the gating system shown in Fig. 5 may be used. Notice that here the gate is attached under the vertical riser and that the sprue

(*Concluded on page* 218)

HOW TO DO IT

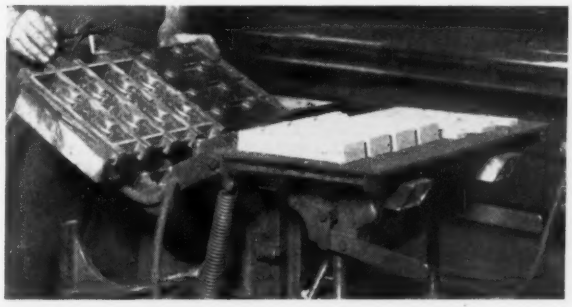
Ganging Up on Small Cores Helps Increase Production

By L. D. PRIDMORE, *president,* International Molding Machine Co., La Grange Park, Ill.
as told to
ROBERT H. HERRMANN, *associate editor*

PRODUCTION of small cores often can be increased by using gang coreboxes mounted, as shown here, on a jolt ram, hand turnover, hand draw machine. The cores need not be identical, and coreboxes of different depths may be mounted together on the machine.

Below, varied size cores are made at the same time in separate coreboxes and rolled over and vibrated out on a common coreplate. The trick here is to stool up the different size coreboxes to the same face level with pieces of wood when mounting them on the rollover frame of the machine.

In the set-up at right, 48 identical cores are made at one time, rolled over on the coreplate, and are ready for the oven immediately after drawing.



Do you have any tricks of the trade tucked away with your foundry experience? Why not release them to fellow foundrymen? FOUNDRY will pay a minimum of $15 for each idea submitted and published. Send a photo or drawing with your idea

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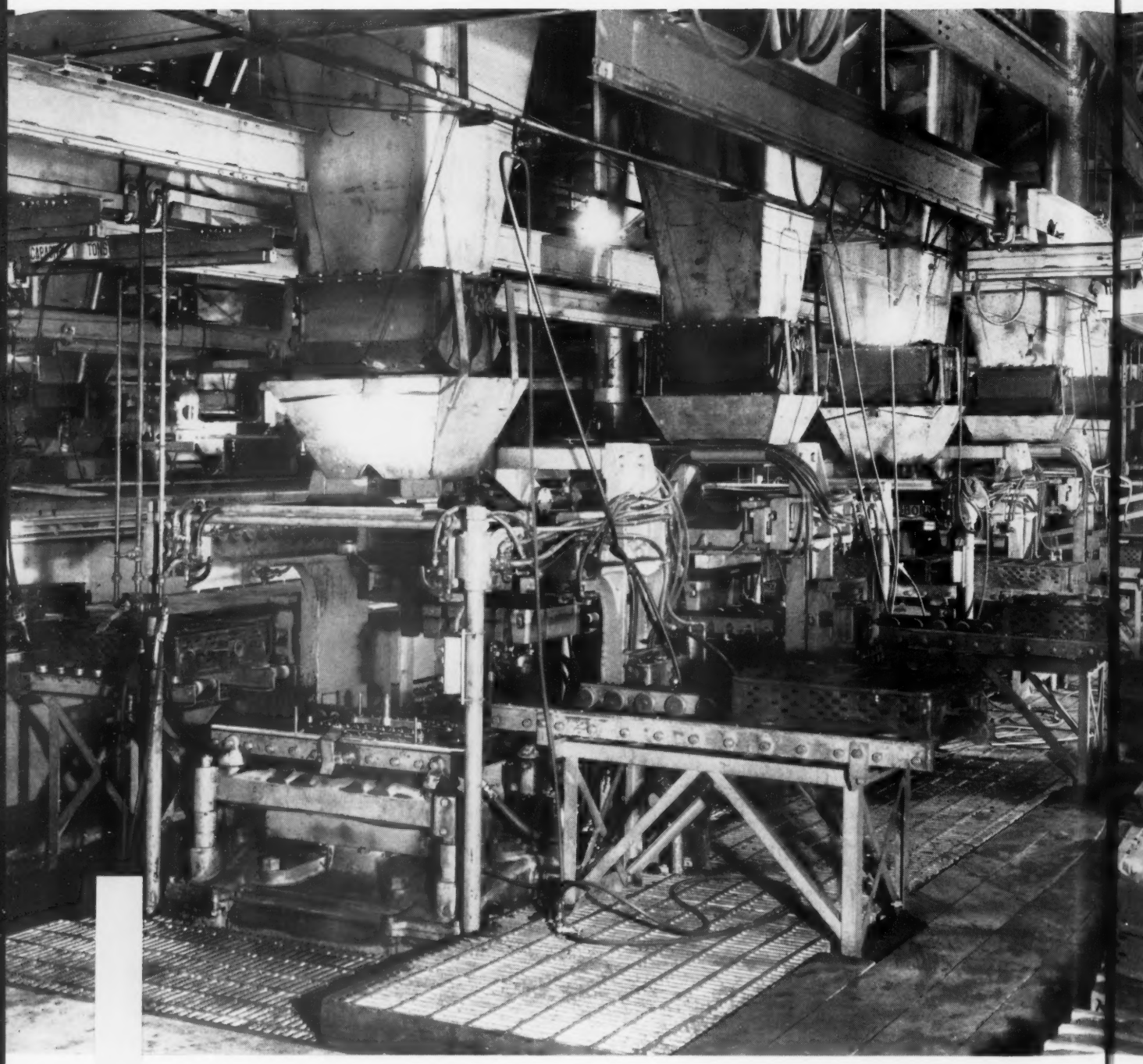
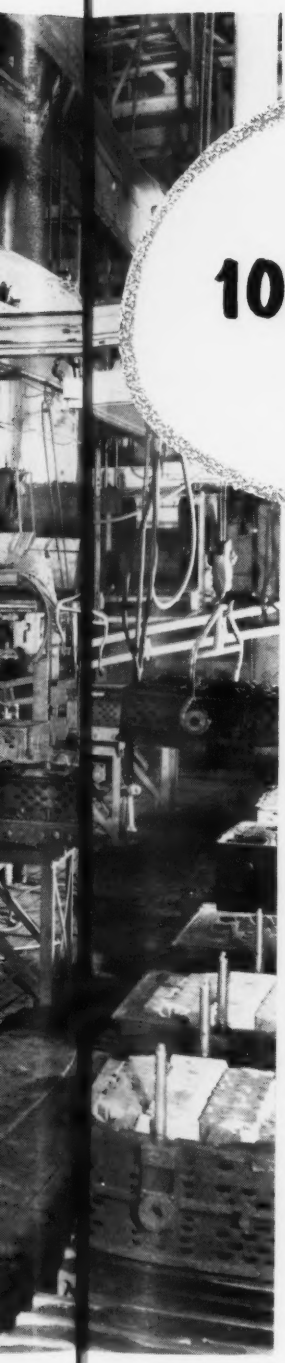
LARGE OSBORN JOLT SQUEEZE

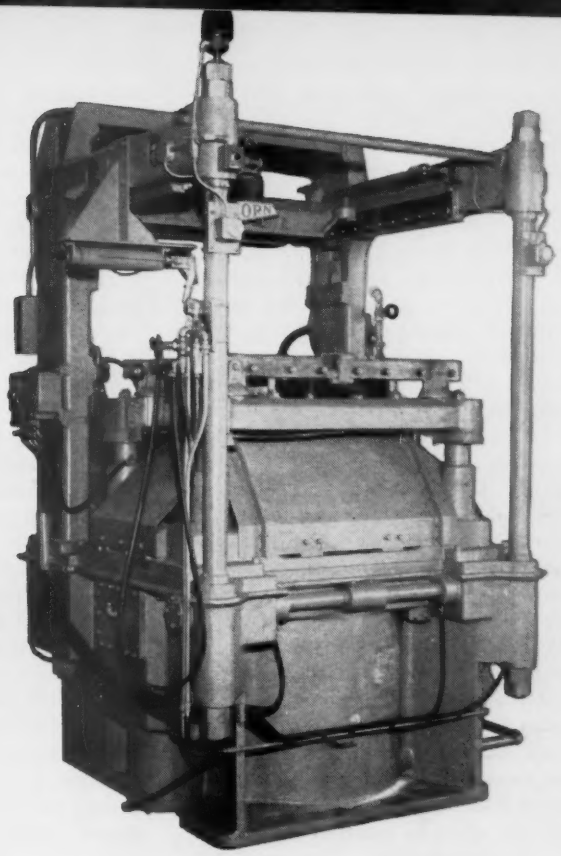


Automotive Installation of nine semi-automatic No. 1230 Osborn Jolt Squeeze Strippers equipped with side roll on—roll off. Machines shown are making copes and drags for automotive cylinder heads.

EZE STRIPPERS



Produces 100 molds per hour *and more*



Large No. 1236 Osborn Jolt Squeeze Stripper. Available with semi-automatic or fully-automatic controls to produce molds on preset time cycles.

Simplifies mold production

WITH Osborn's Jolt Squeeze Strippers, large mold production is completely mechanized. Molds are turned out on fast, predetermined time cycles, assuring uniform top-quality output . . . at low cost per mold.

Production of molds is simple. The operator rolls on the flask and trips a valve, lowering the flask to the jolt table. After filling the mold with sand, another control is actuated to start a predetermined jolt cycle. For added safety, dual operating valves are tripped to perform the squeeze. The mold is then stripped and rolled off on a conveyor.

When furnished with automatic controls, the operator has only to position the flask, fill it and push a button. The Jolt Squeeze Stripper goes through the entire operation, automatically ejecting the finished mold.

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OSBORN

MOLDING MACHINES CORE BLOWERS

(*Concluded from page 215*)

is choked.

Both green sand and oil-bonded core sand have been used successfully in making up Webbert-bar molds. The permeability in either case should be in the high side, with the moisture low to restrict absorption of mold gases by the metal. Ramming should not be too hard, and use of a water swab is not desirable. Attention to such details reduces chances of lowering metal quality since the liquid metal runs over the sand.

From the not inconsiderable research done on the subject, it is known that pouring temperature is an extremely critical factor in obtaining optimum test bar properties with long-freezing-range alloys. Use of too low temperature restricts feeding; use of too high temperature stimulates mold-gas problems and necessitates heating metal in the furnace to an excessive temperature, which can cause gas absorption. A relatively narrow range of pouring temperature must be used with the various tin bronze alloys if highest tensile properties are to be obtained. Some of the known values are listed in Table I. In many cases a foundryman can determine optimum pouring temperature for his particular practice only by experiment. It is desirable to do so, and once this knowledge is available it should be used any time test bars are made.

Metal Practice—The primary objective of all that has been said up to now is to advise how to produce the highest possible quality of test bar casting so that it will be possible to measure only the quality of the metal poured into the casting. Metal quality means the correct chemical composition, the lowest obtainable gas content and freedom from nonmetallic matter.

If the final results of the tensile test meet the required specification, it can be assumed that both metal quality and test bar casting practice are satisfactory. If the tensile test results are below specification and the best casting practice has been used, it must be assumed that metal quality was responsible. If the tensile test results are poor and the casting practice poor, it is almost impossible to know if metal quality was satisfactory. For this reason, the best foundry practice *always* must be used in making test bars.

With regard to metal quality, it must be assumed that any foundryman producing castings to specification will insure correct chemical composition by use of high grade ingot metal or his own carefully segregated gates and risers and that he would not gamble by using metal of unknown or uncertain composition. Not only can small amounts of certain impurities take an alloy out of chemical specification, but they also can impair tensile properties badly.

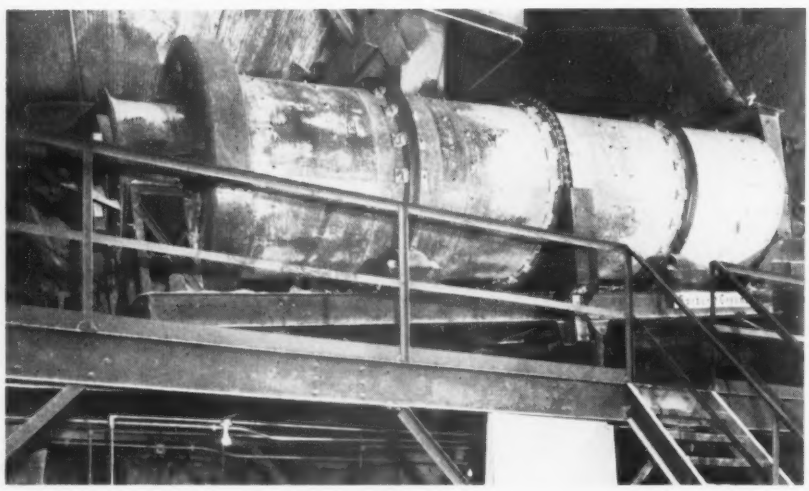
Preventing absorption of gas by molten metal is largely a matter of establishing a consistent and reasonable method for doing so. Since most copper-base alloys absorb gases in the molten state, it is necessary to control the melting operation carefully. The so-called "oxidizing" melting technique is one of the best ways to control gases in copper-base casting alloys. This means keeping the fuel completely burned with some excess of oxygen in the products of combustion. Keeping a sharp green flame over a gas or oil-fired furnace is usually an indication of an oxidizing atmosphere. Smoky, yellow flames can cause gas absorption by the metal.

It is most important to expose the molten metal to any furnace gases for only the shortest possible time. This means fast melting and avoidance of overheating or "stewing" by not holding up metal until molds are made. Good scheduling helps to avoid holding liquid metal unnecessarily long. Overheating metal in the furnace is especially harmful since the rate of gas absorption is proportional to the metal temperature. Better control of pouring temperature is possible if the metal in the furnace is superheated only enough to provide for handling prior to pouring.

Generally speaking, uses of fluxes and covers should not be indiscriminate. Be certain you understand the reasons for using any flux or cover. It can be demonstrated that high quality metal can be made with and without fluxes. Use of a deoxidizer such as phosphor copper is necessary with an oxidizing melting practice. Phosphor copper serves a number of useful purposes and almost always should be used with tin and leaded tin bronzes.

Control of nonmetallic materials in the metal is possible by avoiding stirring of liquid metals. The less the surface is disturbed, the smaller the chance of forming oxides which may be trapped in the metal. Stirring also breaks loose from the crucible or ladle particles that might end up in the casting. Further control of inclusions and oxides is possible by care in pouring the metal. Since pouring metal is by its very nature a turbulent operation, it is necessary to minimize the harmful effects by careful control.

(*To be concluded next month*)



ROTARY DRUM DRIER produced by Barber-Greene Co., Aurora, Ill., has been installed at the American Silica Sand Co. plant near Utica, Ill., for the drying of pit-run sands. The unit is gravity fed, with the sand passing through a rotating drum before being elevated by flights to be dropped repeatedly through a hot-gas blast. The dried sand then drops on a vibrating screen for removal of oversized particles before storage

Information Available For Small Business

The office of information and managerial assistance of the Small Business Administration, Washington 25, has published an informational booklet, "Small Business Administration," explaining the organization of this agency and what services are available in advising, counselling, assisting and protecting small business enterprises. A listing of the regional and branch offices is included.

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A portable air grinder equipped with an 8 x 1 x ⅝-in. organic bond, aluminum oxide grinding wheel is used to smooth rough and uneven surfaces on large steel casting

Single end stand grinder equipped with 24 x 3 x 12-in. organic bond, aluminum oxide wheel is used for removing torch marks, fins and parting lines from steel castings

Grinding Operations in the Cleaning Room (II)

By GLENN S. EISAMAN
Sales Engineering Dept., Bonded Products and Grain Div.
The Carborundum Co., Niagara Falls, N. Y.

STAND grinders carry a wider range of wheel sizes than swing frame grinders, carrying wheels from 12 to 54 in. in diam. The usual range used in normal foundry practice is from 14 to 36-in. diam.

These machines usually are of the double end type, consisting essentially of a wheel spindle mounted on a stand or fixed base with a wheel mounted on each of the overhanging ends of the spindle. However, several models designed for single wheel operation are available, and various types of drives are utilized:

1. The wheel spindle may be driven from an overhead shaft, through a belt drive to some central point of the spindle.

2. The spindle may be an integral part of a centrally located motor mounted in or on the base.

3. It may be driven by a motor set in the base of the machine, through flat or multiple V-belts. These models are available with two and three wheel spindle speed changes to allow adjustments for wheel wear.

Application and Use — The stand grinder of single or double end type is used to grind work which can be handled manually and presented to the wheel face. This manual handling of the castings is in contrast to the machine manipulation involved in swing frame grinding operations.

Fixtures and light chain hoists may be used as auxiliary aids to manual operations, but the work usually is lighter and the grinding is done on more restricted areas than with the swing frames. There is considerable overlapping without loss of economy between swing frame and stand grinding operations. In many cases light work of repetitive nature can be securely clamped or held in a fixture and ground with equal or greater overall economy with a swing frame grinder. Selection of machine type for a given operation cannot be determined fully by casting weight.

Factors affecting economical operation of stand grinders follow:

Machine Size—Since in the case of stand grinders the machine position is fixed, added size and weight place no limitation on the operation as in the case of swing frame operations. In fact, from most points of view the larger machines are more desirable, more productive and even more economical.

Casting Size—Casting shape, size and weight and the handling and movements necessary to present the work to the wheel are the chief factors affecting operator fatigue. Since many grinding operations are performed with actual body contact with the casting being ground, any resulting vibration can place severe strain on the operator. Reinforced leather aprons can be worn by the operator to lessen and distribute these forces and always should be used where direct body contact is long sustained.

Whereas in swing frame grinding wider wheel faces usually are indicated, thinner wheels may be used advantageously on stand grinders to increase unit work-wheel pressure, by reducing the width of contact.

Horsepower—Most stand grinders are sold and powered for manual operation, independent of the use of mechanical aids. The added use of levers, pressure bars and other mechanical aids, to increase pressures at the wheel-work interface, create overloads on the motor and drive,

(*Continued on page* 222)

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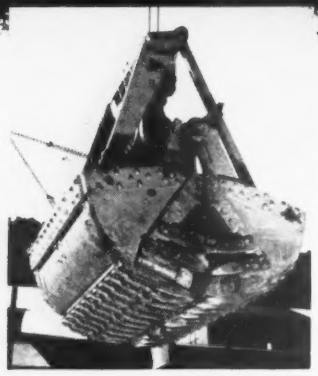
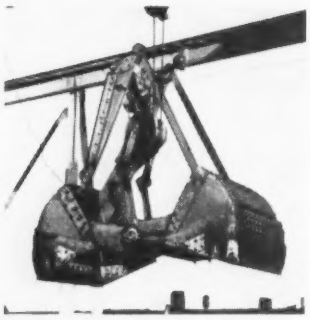


BLAW-KNOX "SHARK TOOTH" BUCKETS HANDLE COKE WITH MINIMUM DEGRADATION

Use this versatile *dual-purpose* bucket for efficient coke handling. Without the liner plates, the shark teeth literally finger their way through the coke so it can be handled with minimum degradation. Hook-on feature permits quick change for other foundry service requirements.



BLAW-KNOX "SHARK TOOTH" BUCKETS *with liner plates* HANDLE SAND WITH MINIMUM LEAKAGE

This open head type Single-Line Hook-On Bucket, *with liner plates attached* inside of the shark teeth, economically handles sand, coal, small limestone and granular fines with minimum leakage!

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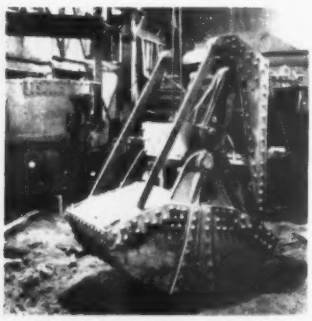
This Single-Line Hook-On Bucket solves rehandling problems when headroom is extremely limited. The ¾-yd. capacity bucket requires only 6'7" operating headroom. Also available in larger sizes.



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BLAW-KNOX FOUNDRY BUCKETS

THE MOST COMPLETE RANGE OF SIZES AND TYPES

(*Continued from page* 220)

and unless adequate power and transmission is provided, high maintenance costs of the motor, power transmission and spindle bearing will result.

In many cases the operator uses the casting or work as a lever, with the work rest as a fulcrum, or he wedges the casting between the work rest and the wheel face, to obtain leverage for resultant increase in grinding pressures. Dropping or lowering the rest to permit grinding below the horizontal center line of the wheel produces the same result. This practice is dangerous because the work often is caught between wheel and work rest, resulting in wheel breakage.

It is not to be inferred from the above that levers and higher than normal working pressures are undesirable. Such is not always the case, but on any grinding operation where working pressures are set up beyond the machine and power limitations, the operation will prove costly from the standpoint of efficiency of operation and maintenance costs.

It also must be recognized that on double end stands, involving two wheel operations on a single spindle, the power requirements involve two wheels and two operators grinding simultaneously. Due to the single wheel operation on a swing frame grinder, the single operator can control overloads. Such is not the case with two wheel operations from a single power source and for this reason, wheel operations are more frequently found to be carrying overloads.

Double End Grinder Problems—The double end stand grinder carries two wheels on opposite ends of the same wheel spindle driven from a single power source. The safe operating spindle speed in such cases is, of necessity, determined by the diameter of the larger wheel. If there are extreme diameter differences, the smaller wheel becomes inefficient, resulting in a lower stock removal rate and a higher abrasive loss with consequent increased abrasive cost. To control and more nearly equalize wheel diameters throughout the life of two wheels, several stratagems have proven effective. Unequal wheel wear stems from several basic causes: Differences in work types ground at the opposite ends of the machine; differences in operator grinding techniques; differences in physical strength and stature of operators, and differences in

(*Continued on page* 224)

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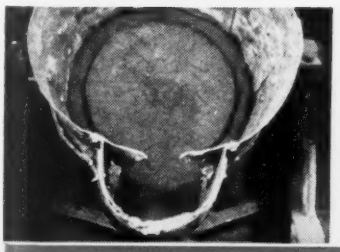

1. Tamp in bottom, leaving a trench around outside edge.

2. Place slices solidly in trench to provide sealed joint.

3. Peen joints where slices butt together, forming valley.

4. Tamp narrow strips into valleys to seal joints tightly against metal penetration.

5. Taper top edge; ramp in fillet between sidewall and bottom to form a tight seal.

6. Form pouring spout; build bridge to form skimmer. Roughen entire lining surface.

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5. **AW2B (E9016)** — For repair welding of cast armor, "off analysis" and high-sulfur steels.
6. **P&H # 7 (E9016)** — Matches properties of Grade C and castings of similar analysis after heat treatment.
7. **90LH-2 (E10016)** — For high-tensile castings and alloy steels, such as SAE 8630, 4130, and comparable types, where the weld metal must match the heat-treating properties of the parent metal.

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(*Continued from page* 222)

characteristics of the materials being ground.

To create optimum standardization of the grinding operation, the following steps may be taken:

1. Operators should be matched or teamed for each double end stand according to their techniques, work habits and physical strength.
2. The work to be done on each wheel should be classified and equalized.
3. Work of similar types with respect to weights, shape and type, stock distribution and metallurgical characteristics should be routed to the two ends of the machine, or if this proves uneconomical, equal amounts of each variety should be routed to each end or operator.

Adoption of all these steps will tend to equalize wheel wear and maintain uniform wheel diameters. The degree and extent to which such classifications are practical depend on the size of the overall operation, but much can be accomplished by this type of classification, even with limited standardization on even the smallest operation.

In passing, it should be mentioned that the psychological effects of such procedures are excellent. Men like competition, and if the rules are correctly written—the stint, the job, the game is played on a basis of equality—competition becomes the keeper. Handicaps due to inequalities generally stifle competition.

Dressing Abrasive Wheels — Several new phases of this problem are presented by stand grinding operations. Abrasive material dressed off a wheel by a dressing tool represents two losses — nonproductive abrasive and loss in productive grinding time.

Dressing and attendant losses can be minimized through proper selection of abrasive wheel specifications. Glazing of the abrasive wheel generally is caused by the fact that the grade of abrasive wheel used is too hard or the grain size is too fine. Correction of abrasive specification will help eliminate the necessity for frequent dressing. Excessive dressing, where proper abrasive specifications are in use is the result of habit rather than necessity.

As pointed out in the same subject discussed under swing frame grinders, the well instructed operator replaces the dressing operation by intelligent handling of the casting, thereby adding to his productive time. In practically all cases ob-

(*Continued on page* 226)

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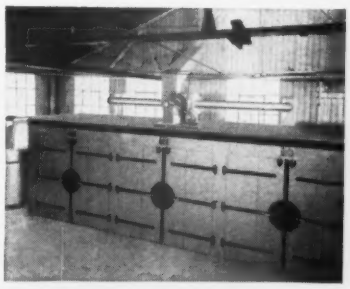
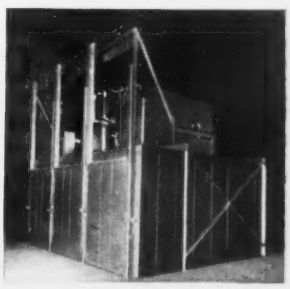
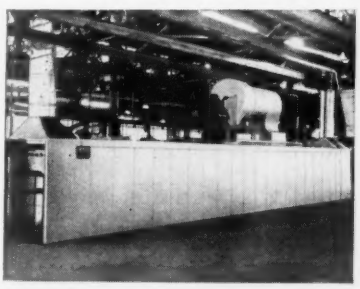


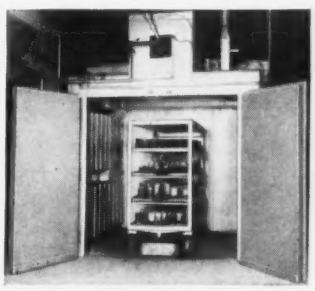
Three Compartment Rack Type Oven



3 Compartment Rack Type Oven



Continuous Core Blacking Oven



De-waxing Oven

Combination Rack and Drawer Type Oven

Plaster Mold Drying Oven

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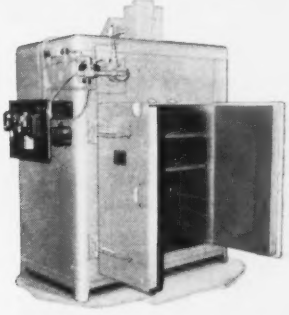


Shelf Type Core Oven

Are YOU trucking "pay dirt" to the dump?

Many a foundry, operated by men who pride themselves on "knowing the score", is actually paying good money to throw money away—

- **hauling used sand to the dump, at heavy expense**
- ***sand which could, at a small cost per ton, be made equal to new sand!***

Are you trucking high grade pay dirt to the dump?

It costs you next to nothing to find out what a fat saving may be hidden in your used refuse sand.

Step 1—Let us process a 5-ton sample of your waste sand in our pilot plant, under actual production conditions, at no cost except transportation . . . *and listen while the results talk.*

Step 2—Get an approximate but exciting idea of how much you can save through Hydro-Blast Sand Reclamation by using our simple Self-Survey Form S-200—you fill in your own figures. It's an eye-opener! Use the coupon.

HYDRO-BLAST

HYDRO-BLAST CORPORATION, 2550 North Western Avenue, Chicago 47, Illinois

☐ Please send particulars on a Pilot Plant test of our used sand.
☐ Also send Form S-200 for a Self-Survey.

Name..... Title.....

Company.....

Address.....

City..... Zone..... State.....

(*Continued from page* 224)

served over past years, the dressing habit once formed by the operator leads to excessive dressing.

In general, the operator who has formed improper work habits usually is the proverbial square peg in the round hole. Elimination or a continuing policy of education and supervision is essential to proper control and is the only solution to this problem.

Truing Abrasive Wheels — True-running of the abrasive wheel is more vital to successful operation of stand grinders than to the operation of swing frame grinders, since the resulting vibration is transmitted directly through the work piece to the operator. As in dressing, the operator can influence the truing cycle by proper manipulation of the casting. Added truing operations are encountered where the operator through negligence does not or through limitation cannot traverse the work.

Where the stock to be removed is located in such a manner that the casting movements are limited to direct infeed (perpendicular to the wheel face without transversing movement) the wheel may become grooved. If the same operation is continued for long, the high shoulders that are built up must be reduced by dressing.

The width of the grinding wheel in use in relation to the grooved width will determine the amount of abrasive loss incurred in truing. The use of a narrower wheel may curtail or eliminate such losses.

Grinding on the corners of the wheel likewise develops angular wheel faces and similar attendant losses, and should be avoided wherever possible. If possible, all grinding should be done across the entire wheel face, or if the contact is too narrow, the work piece should be traversed. The use of levers, so-called pressure bars, tends to eliminate proper traversing movements.

Portable Grinders—Portable grinders are manufactured in a variety of sizes carrying wheels, from ½ to 14 in. in diam. The portable, as the name implies, is a light tool combining a power unit, wheel spindle (usually integral), and housing. It is operated manually, usually without mechanical suspension or support. Special, heavy-duty machines especially designed for foundry uses are available in either pneumatic or electric type.

The most popular machines carry

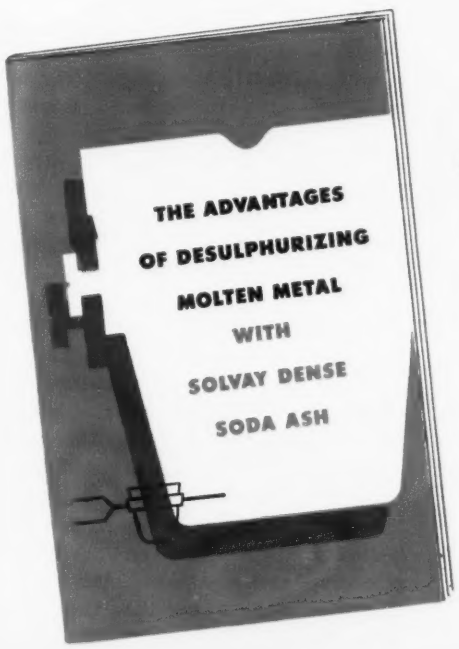
(*Continued on page* 228)

Desulphurization with SOLVAY DENSE SODA ASH

✔ Offers Many Advantages

✔ Costs Less

SOLVAY DENSE SODA ASH is especially effective for desulphurization. This 100% active material helps produce better, more fluid metal . . . and gives you these other advantages: it's free-flowing; the small grains melt very rapidly, allowing faster, more uniform dispersion; and it's easily added by means of simple equipment. The use of Solvay Dense Soda Ash is a flexible one—you use only as much as you need. And remember, Solvay Dense Soda Ash is the *low cost* form of desulphurization!



Further Information Contained in Valuable Book—Available on Request

"The Advantages of Desulphurizing Molten Metal with Solvay Dense Soda Ash" has been published by Solvay for the benefit of the foundryman. It contains important information on the advantages you can gain by desulphurizing with Solvay Dense Soda Ash. It also explains what type of equipment is needed and how to obtain it. This book is available free—on request—by simply writing to Dept. AT6, Be sure to get your copy.

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SOLVAY PROCESS DIVISION

Allied Chemical

ALLIED CHEMICAL & DYE CORPORATION

61 Broadway, New York 6, N. Y.

BRANCH SALES OFFICES:

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Soda Ash · Caustic Soda · Potassium Carbonate · Calcium Chloride · Chlorine
Caustic Potash · Cleaning Compounds · Ammonium Bicarbonate · Sodium Nitrite
Sodium Bicarbonate · Snowflake® Crystals · Para-dichlorobenzene · Monochlorobenzene
Ortho-dichlorobenzene · Ammonium Chloride

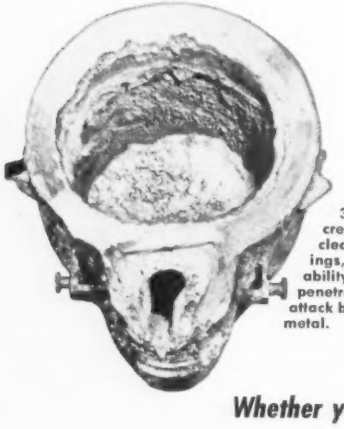
Line ladles for longer life

...Easily, Quickly

with J-M 3X Blazecrete® the hydraulic-setting refractory

Easy to apply—3X Blazecrete—the 3000F refractory—is easily and quickly applied . . . mix with water like ordinary concrete, and slap-trowel to desired thickness. Air-cures without application of heat. Contains no harmful irritants . . . safe even for hand application. 3X Blazecrete is furnished as a dry mix, and may be stored indefinitely without deterioration.

Longer-lasting linings can be built with 3X Blazecrete because it is spall-resistant, withstands slagging action and has negligible shrinkage.



3X Blazecrete means cleaner forgings, has great ability to resist penetration and attack by molten metal.

Send for free brochure on Blazecrete (RC-28A) describing its properties and uses. To obtain a copy—as well as additional application details—write Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay Street, Toronto 1, Ontario.

Whether you gun it... *or slap-trowel it...*

JOHNS-MANVILLE PRODUCTS

Johns-Manville BLAZECRETE

BUILDS BETTER REFRACTORY LININGS

(*Continued from page* 226)

Type 1 (straight wheels) 3, 4, 5, 6 and 8 in. in diam. Plugs and cone-shaped wheel Types 16, 17, 18 and 19 may be used on standard models or on lighter models designed for their specific operations. Machines of the "right angle head" or sander types are designed for the operation of Type 6 and 11 portable cup wheels.

The speed range of these machines follows the pattern of previously described equipments, as the machines in this class are operated in both low speed (6500 sfpm) and high speed (9500 sfpm) ranges.

Field of Use—The portable grinder always is taken to the work and manually operated. It is used in conjunction with and complements the work of both swing frame and stand grinders, and has a field in its own right.

It performs the lighter grinding operations on the heaviest work pieces where heavy stock removal is not a requirement. It is a necessity in grinding work areas which are inaccessible to either stand or swing frame grinders, such as holes, radii, fillets, etc.

The portable grinder is adapted ideally to operations where light stock removal is indicated, on such operations as light weld reduction, light parting line fins, and on large areas where the removal of surface scale or pimples is involved.

Application and Safety—Diversity of application of this equipment makes it impossible to discuss the field in detail. The principles discussed on the two machine types previously described generally are applicable to portable grinders.

However, several points based on general observations may be worthy of note. Those concerning safety of operation seem to be most important.

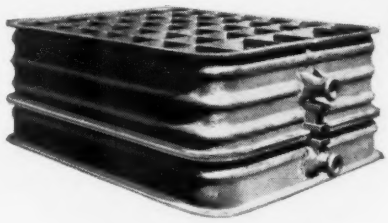
Since wheel diameter and arbor holes, are identical on both high and low speed machines, there exists an interchangeability of mounting and a frequent hazard is created by mounting the vitrified, low speed wheels on high speed equipment. Supervisors and operators must be instructed and machines identified so that this will not occur. Many plants resort to painting the machines different colors to accomplish this identification.

The machine spindle speed is controlled by governors on most air grinders and periodic inspection should be made to see that these are

(*Continued on page* 230)

YOU CAN IMPROVE FOUNDRY EFFICIENCY AND ECONOMY

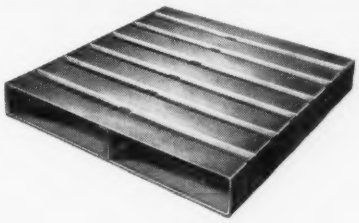
at these 4 stages of production



CH-40
Crane Handling Flask

MOLDING WITH REPUBLIC STEEL FOUNDRY FLASKS

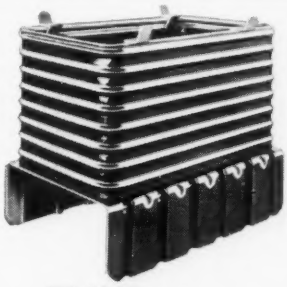
speeds efficiency through ease of operation and ease of handling. You enjoy real economy through long, trouble-free service. Republic Flasks are designed and built to meet the needs of the individual job.



P-14
Doubleface Pallet

MOVING WITH REPUBLIC STEEL PALLETS

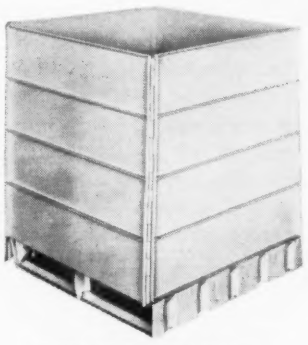
keeps production lines running smoothly. Materials are available when and where you need them. Republic Steel Pallets are designed to eliminate maintenance expense. They can be depended upon to give years of service at minimum cost.



PB-120T
Box and Skid with Tiering Lugs

STORING WITH REPUBLIC STEEL BOXES AND SKIDS

conserves valuable space. In addition, Republic Boxes and Skids are used to keep materials on the move from receiving to shipping. They are made in a wide range of sizes to meet your individual requirements.



COLLAPS-A-TAINER

SHIPPING WITH REPUBLIC STEEL COLLAPS-A-TAINERS

cuts your handling costs. The Collaps-a-tainer can be loaded at the end of the production run, and shipped as is. To return, it is quickly and easily knocked down. Four collapsed units ship in the space of one open. Standard size is 30" x 30" x 30". It can be stacked to any practical height.

For more information on the complete line of Republic Materials Handling Equipment, write for our new catalog No. 620.

REPUBLIC STEEL CORPORATION
Pressed Steel Division
6208 Truscon Avenue, Cleveland 27, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N. Y.

REPUBLIC STEEL

REPUBLIC
MATERIALS HANDLING EQUIPMENT

(*Continued from page* 228)

operative and have not been changed or altered.

The wheel guards provided with the machines should be used. Where this is impractical, special studies should be made to provide for the safe operation of the machine and wheel equipment. On other machine types, such as swing frame and stand grinders, adequate guards can be provided to contain the wheel fragments in case of breakage.

The problem with portable wheel operations is more difficult because of the unusual flexibility of the operation. Wheel exposure with proper guards and machine manipulation may be adequate for operator protection, but will rarely protect the area surrounding the operation. Many plants now provide portable screens or completely enclose the work, machine and operator in grinding booths.

Abrasive Costs — Grinding costs are made up of three elements: Abrasive cost, labor cost and overhead.

A proper balance must be established among these factors to give minimum over-all costs. Operational factors influencing these cost elements have been pointed out under each machine heading. No detailed cost analysis will be attempted here.

In passing, it might be well to point out several obvious influencing factors and to stress several other related factors which have been neglected.

Hard wheels give lower removal rates, and tend to increase labor and overhead costs and to lower abrasive costs. Soft wheels give higher stock removal rates, and tend to increase abrasive costs and to lower labor and overhead costs. Higher working or grinding pressures tend to increase stock removal rates, thus decreasing labor costs, but increasing abrasive costs. These facts are more or less obvious.

The statement has been made previously that "high speed" wheels cost more per cubic inch of usable abrasive; they must show reduced labor and overhead costs to be economical.

The greatest economies are shown, therefore, where actual grinding or contact time is highest, and where handling time or interruptions for crane service are a low percentage of the over-all time. As an example, let us assume that a wheel will remove 40 lb of stock per hour at a maximum uniform cutting rate and that under identical conditions another wheel will remove 20 lb per hour. If the contact time is 100 per cent, the 40 lb per hour wheel will remove 40 lb of stock per hour and the 20 lb wheel will remove 20 lb. In this case metal is presented to the wheel face so that it cuts at a uniform optimum rate for the full contact time. This is rarely the case, due to stock distribution.

To further illustrate the point that there is a wide difference between grinding contact time and optimum effective grinding contact time, the same optimum stock removal rates as stated in the first conditon is assumed. In addition, although both wheels are in continuous contact, "throwing sparks," the rate at which metal is fed to the wheel is varied. In an hour's contact time, the 40 lb per hour wheel is fed for 50 per cent of the contact time at its optimum rate and will remove 20 lb of metal. The remaining 50 per cent of the contact time, it is fed stock not at its optimum rating, but at the rate of only 20 lb per hour and will remove 10 lb. Overall stock removal will be 30 lb.

The 20 lb per hour wheel, in an hour's contact time, is fed for 50 per cent of its contact time at its optimum stock removal rate of 20 lb and will remove 10 lb of stock. When fed at the same rate as the 40 lb per hour wheel (which is the optimum rate of the 20 lb per hour wheel), it will remove another 10 lb of stock. Overall stock removal will be 20 lb.

Cuts Only Part Time

In the first case, the 40 lb per hour wheel removes 20 lb more stock than the 20 lb per hour wheel, an increased removal of 100 per cent.

In the second case, the differential is only 10 lb per hour or 50 per cent increase in stock removal.

The 40 lb per hour wheel has lost 50 per cent of its advantage or effectiveness due to the fact that it was not cutting for the full time at its optimum removal rate.

The distribution of stock on a given piece to be ground determines what percentage of the time a wheel is cutting at its optimum removal rate. The percentage of contact time in relation to over-all time therefore is a deciding factor in determining whether "high speed" wheels which give high stock removal rates will prove economical and determine to a large degree the extent of the resulting economy.

This probably accounts for the fact that throughout steel foundries, "high speed" high production wheels show unquestionable economy, while in some malleable foundries the use of resinoid wheels, as opposed to vitrified is a moot question; and in gray iron foundries, vitrified wheels still predominate.

Steel castings in general present

(*Continued on page* 232)

A NEW METAL TREATING plant, Metallurgical Inc., featuring latest types of equipment for the treatment of ferrous and nonferrous metals was opened recently in Minneapolis. Al Ridinger, president, is shown pointing out the method used in tempering steel flaps for B-47 Strato-Jet bombers. A fixture of steel flaps is being quenched in oil after being removed from the radiant tube, gas-fired furnace at the right

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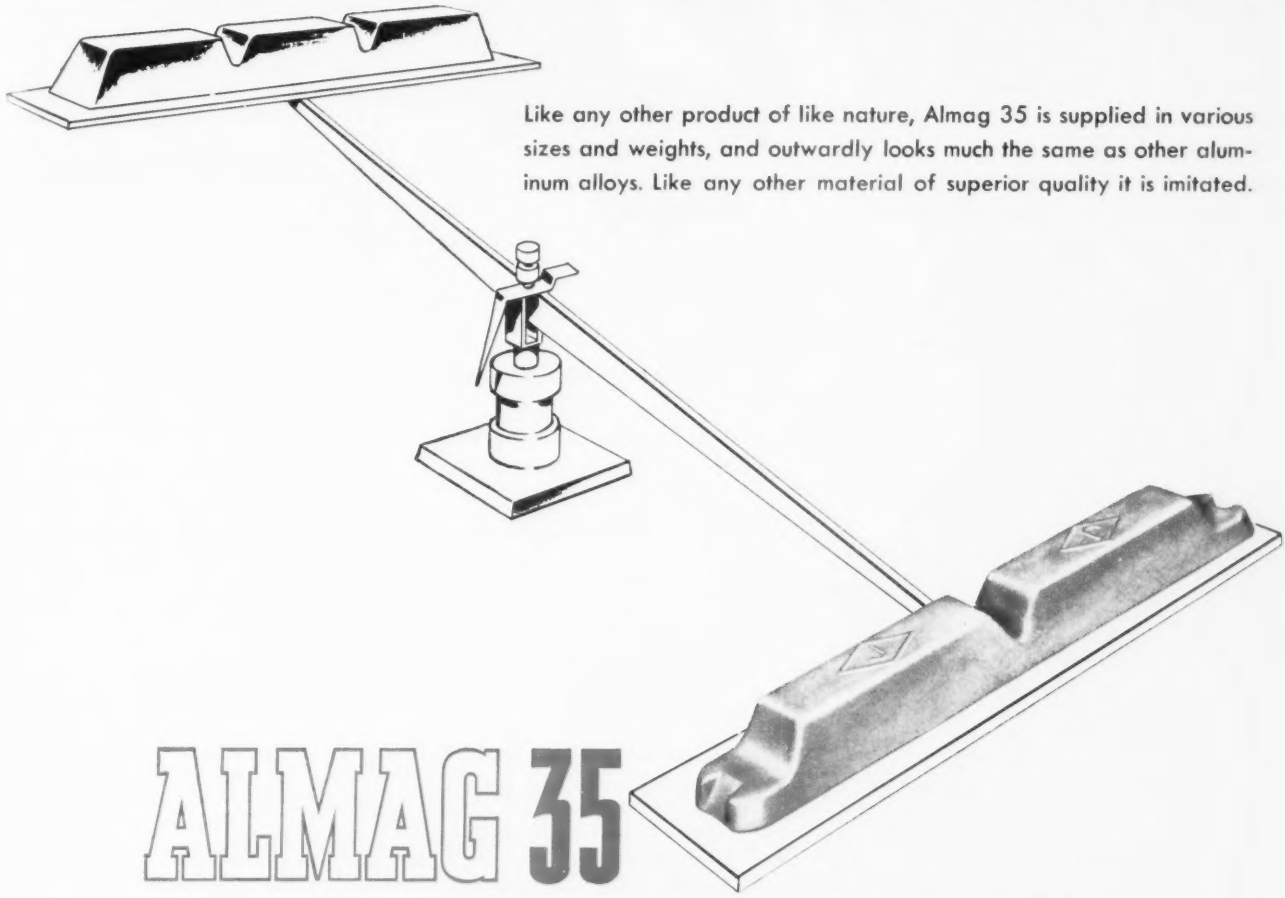

Like any other product of like nature, Almag 35 is supplied in various sizes and weights, and outwardly looks much the same as other aluminum alloys. Like any other material of superior quality it is imitated.

ALMAG 35

....the Standard of Comparison for judging Aluminum alloys.

We're flattered by this attention because it gives us the opportunity of telling you that imitation, except by exact duplication, is impossible. Duplication is also impossible because Almag 35 is completely covered by patents. By no means, short of duplication, can the outstanding properties of Almag 35 be achieved . . . properties which have been proven, repeatedly, in customers' plants, by government services, and in commercial and service laboratories for nearly 10 years.

Now it costs no more to buy Almag 35 than any of its imitations. So why not specify Almag 35 and enjoy the combined advantages of high strength and ductility, dimensional stability, high shock and corrosion resistance and *no* heat treatment . . . found only in Almag 35, as cast?

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WILLIAM F. JOBBINS INCORPORATED

AURORA, ILLINOIS

P. O. BOX 230

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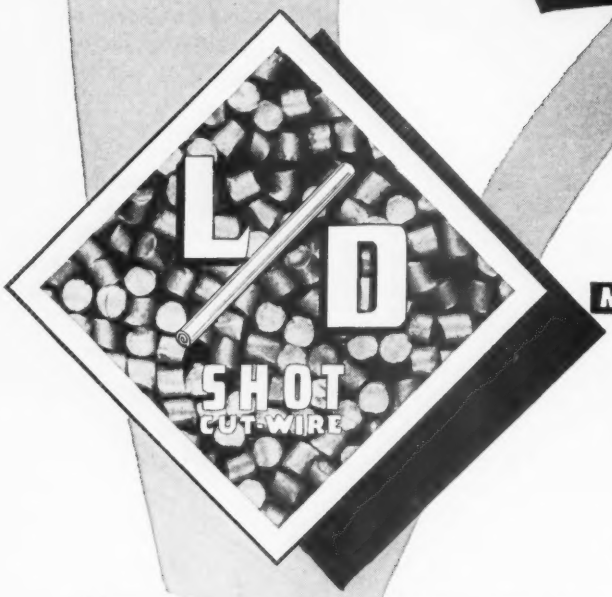

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Harrison L/D Cut-Wire Shot provides these four outstanding advantages:

✓ **LONG LIFE**	Lasts many times longer than any cast shot. Stands up against thousands of impacts.
✓ **UNIFORM SIZE**	Cut to specific sizes. Each particle size provides same impact and same finish.
✓ **UNIFORM HARDNESS**	Variable hardness of malleable iron or steel shot is avoided—each piece is the same.
✓ **LOWER COSTS**	You save on total abrasive cost, labor, maintenance, machine time, handling and storage.

Send for
TECHNICAL BULLETIN
No. 7
"Cut Wire Shot
—Its Development
and Use"

Available in Steel, Copper and Stainless, in a range of wire diameters and other properties. Can also be produced from any desired type of wire with sizes varied as to relation of length to diameter.

HARRISON ABRASIVE DIVISION
METALS DISINTEGRATING COMPANY, INC.
Elizabeth B, New Jersey

HARRISON ABRASIVE FOR METAL BLASTING SHOT GRIT

MD PRODUCTS

Also producers of HARRISON CHILLED SHOT—HARRISON DIAMOND GRIT
SUBSIDIARY OF AMERICAN-MARIETTA COMPANY

(*Continued from page* 230)

large volumes of metal in more restricted areas, resulting in a greater percentage of contact time at the optimum cutting rate. Heavy malleable may approach the conditions found in steel castings, but with gray iron castings, parting line fins and the light or clean, closely broken gates do not allow the wheel of high production rate to be operated at or near its highest efficiency.

The grinding of hard or white iron unannealed malleables presents a problem similar to that of gray iron insofar as stock distribution is concerned, but the questionable application of "high speed" wheels stems more from the inherent hardness of the materials themselves than from any other single factor. In the grinding of hard materials in general, low speeds are indicated; better penetration is obtained at slow speed. This is one man's answer to the moot question of the application of "high speed" wheels to these materials.

Other economies can be effected through quantity purchases. The list price is subjected to different discounts depending on the quantity purchased. Also it is wise to use all the usable abrasive. Much profit is thrown away in the form of oversize wheel stubs.

Summary—Cost reductions can be obtained by the following:

1. Use of the correct type and size of grinding equipment with ample power to meet the individual needs.
2. Through standardization and classification of work.
3. By proper selection of abrasive specifications in relation to work classification and equipment.
4. Through increased percentage of grinding time. Crane service delay should be minimized and work handling facilitated.
5. Through education of supervisors and operators on the factors affecting costs and savings.
6. By giving the same close study and attention to the cleaning room as is given to the melting and pattern shops and the foundry.

In conclusion, two questions arise which do not fall within the scope of this discussion, but they seem pertinent to it and have a definite bearing on foundry cleaning room costs. The questions are these:

1. How much attention is being given in original molding practice to the location and amount of stock that eventually must be removed in

(*Concluded on page* 235)

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7	42	76	167	209	250L	278BL	300L	312R3
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13	49	82	179	216-7	255	283	306L	316L1
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17	53	183	184-5	222	258	286BL	308TL	316L3
18	54	125	187	223	259	287R	308BL	316R3
19	55	126	189	224	260	287L	308R1	316-4
20-21	56-57	128-9	191	225	261	288	308R2	317TR
22	58	131	192	226	262	289	308R3	317BR
23	59	133	193	227	263	290TL	308R4	317TL
24	60	134	194L	228	266	290BL	309R	317BL
25	61	137	194R	229	269	291	309TL	318T
26	62-63	138	195	231	270	292TL	309BL	328T
27	64	141	196	232	271	292BL	310R1	328B
28-29	65	143	197	235R	272TL	293	310R2	331R
30	66	144	199	235L	272BL	294TL	310R3	331L
31	67	147	200	237	273	294BL	310R4	332
32	68	149	201	239	274	295	311R	IBC
33	69	153	203	241	275	296TL	311TL	OBC

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12	48	81	177	214	254	282	305	315TL
13	49	82	179	216-7	255	283	306L	316L1
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24	60	134	194L	228	266	290BL	309R	317BL
25	61	137	194R	229	269	291	309TL	318T
26	62-63	138	195	231	270	292TL	309BL	328T
27	64	141	196	232	271	292BL	310R1	328B
28-29	65	143	197	235R	272TL	293	310R2	331R
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31	67	147	200	237	273	294BL	310R4	332
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Alnor Velometer, a precision-built, self-contained, portable instrument, gives you instant, *accurate* readings of air velocities anywhere—in plants, mines, mills or laboratories. Measures speed of air flow through ducts, grilles, furnaces, spray booths or in the open. This rugged instrument needs no special care or delicate handling—anyone can use it and get accurate readings. Need no calculations or reference charts. Available in a wide variety of scale ranges, and with a full assortment of jets and fittings for every application. You'll want full details and prices, so write for Bulletin 2448-G, Illinois Testing Laboratories, Inc., Room 511 420 No. La Salle St., Chicago 10, Ill.

Alnor

PRECISION INSTRUMENTS FOR EVERY INDUSTRY

(*Concluded from page 232*)

the cleaning room?

2. How much attention has been given to the reduction of stock to be removed by grinding through closer torch burning or cropping of gates, heads and risers?

As a final observation, it usually is cheaper to leave unnecessary stock off any work piece than to take it off later.

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To Study Photoelasticity At MIT Session

Applications of polarized light to problems in stress analysis will be the subject of a special summer program in Industrial Photoelasticity to be offered July 26-Aug. 6 at the Massachusetts Institute of Technology. The program is designed for the practicing engineer who has no previous knowledge of the subject. Emphasis will be on applications of the method to industrial problems. MIT faculty members will conduct the program.

Morning lectures will be illustrated by laboratory sessions each afternoon. Topics to be discussed will include the basic photoelastic theory, auxiliary methods of analysis, photoelastic materials, and laboratory equipment.

Tuition for the program will be $160. No academic credit will be offered. Further details and application blanks may be obtained from Summer Session Office, Room 7-103, Massachusetts Institute of Technology, Cambridge 39, Mass.

Index to ASTM Standards

The American Society for Testing Materials, 1916 Race St., Philadelphia 3, has issued its 1953 *Index to ASTM Standards*. Containing 272 pages, the book lists the 1124 standards and 872 tentatives of the society both by subject and in numeric order.

7 things to remember about BLASTRITE SHOT AND GRIT

QUALITY
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LONG WEAR
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ACTIVITIES OF FOUNDRY GROUPS

CHICAGO Chapter of the AFS met on Apr. 5 at the Chicago Bar Association. Shown in the illustration above, from left to right, are Roy Nelsen, Sterling Wheelbarrow Co.; Arnold Grot, Edward Valves Inc., C. V. Nass, Beardsley & Piper Division, Pettibone Mulliken Corp.; Robert Aeberly, Electro-Metallurgical Co., Division, Union Carbide & Carbon Corp.; H. D. Krummel, Socony-Vacuum Oil Co., and Harold Reckart, National Malleable & Steel Castings Co. Bottom, left to right, are John Owen, Harbison-Walker Refractories Co.; John Rassenfoss, American Steel Foundries, chapter chairman; S. C. Massari, Hansell-Elcock Co.; Robert Dalton, Hills-McCanna Co.; Joseph Schallerer, Calumet Pattern Works; Robert Hendry, Love Bros. Inc.; Ted Haines, Woodruff & Edwards Inc.; K. P. Smith, Chicago Malleable Castings Co.; G. Skupa and E. E. Schwantes, both from McCormick Works, International Harvester Co. Photographs are by Fred Ridenour, Whiting Corp.

Chicago

FOR president for 1954-55, Chicago Chapter, AFS, has elected Robert L. Doelman, sales engineer, Miller & Co., who was vice president for the past year. Other officers elected at the regular monthly meeting at the Chicago Bar Association, May 3, include James T. Moore, office manager, Wells Mfg. Co., and previously Chapter treasurer, to be vice president; and Daniel R. Jones, sales,, Illinois Clay Products Co., to be secretary.

New directors elected for 3-year terms include Harry C. Swanson, vice president, Arrow Pattern & Foundry Co. Inc.; Ford R. Snyder, metallurgist, Hickman, Williams & Co.; and S. C. Massari, general manager, Foundry Division, Hansell-Elcock Co.

By way of winding up business of the year, President John A. Rassenfoss called for one committee report, then reviewed activities in a report of his own. In the absence of the Director of Membership, report of that committee was made by R. P. Schauss, Chicago manager, Werner G. Smith Inc. The goal of reaching an 816 total membership was achieved.

Mr. Rassenfoss then introduced President-Elect Doelman and formally transferred his duties of office. After acknowledging his election, Mr. Doelman presented to Mr. Rassenfoss the Chapter's "Oscar," the Past President's Statuette in recognition of his service during the past year.

C. V. Nass, vice president, Pettibone-Mulliken Corp., and vice president and general manager of its Beardsley & Piper Division, provided the technical part of the program. As a special and prologue feature, he presented an 8-minute preview of a forthcoming three-dimensional movie made by his company to illustrate high-production molding techniques. Specifically, the film showed the mechanized molding of thin-walled radiator sections in the Edwardsville, Ill., plant of U. S. Radiator Corp.

Main contribution of Mr. Nass was a sound-movie which Beardsley & Piper has prepared to demonstrate "Mechanization in Coremaking." In prefacing it, the speaker declared that contrary to the oft-heard comment that the small foundry can't afford to mechanize, the small shop can't afford not to mechanize within reasonable limits if it is to keep pace with progress and remain competitive. At the same time, he warned there sometimes is overmechanization—and it can prove costly.—*Erle F. Ross*

Chesapeake

METHODS of inspection was the topic covered by Clyde B. Jenni, chief metallurgist, General Steel Casting Co., Eddystone, Pa., who spoke at the Mar. 26 meeting of Chesapeake Chapter of the AFS. Mr. Jenni talked about design, visual inspection, use of radiograph, gammagraph and magnaflux.

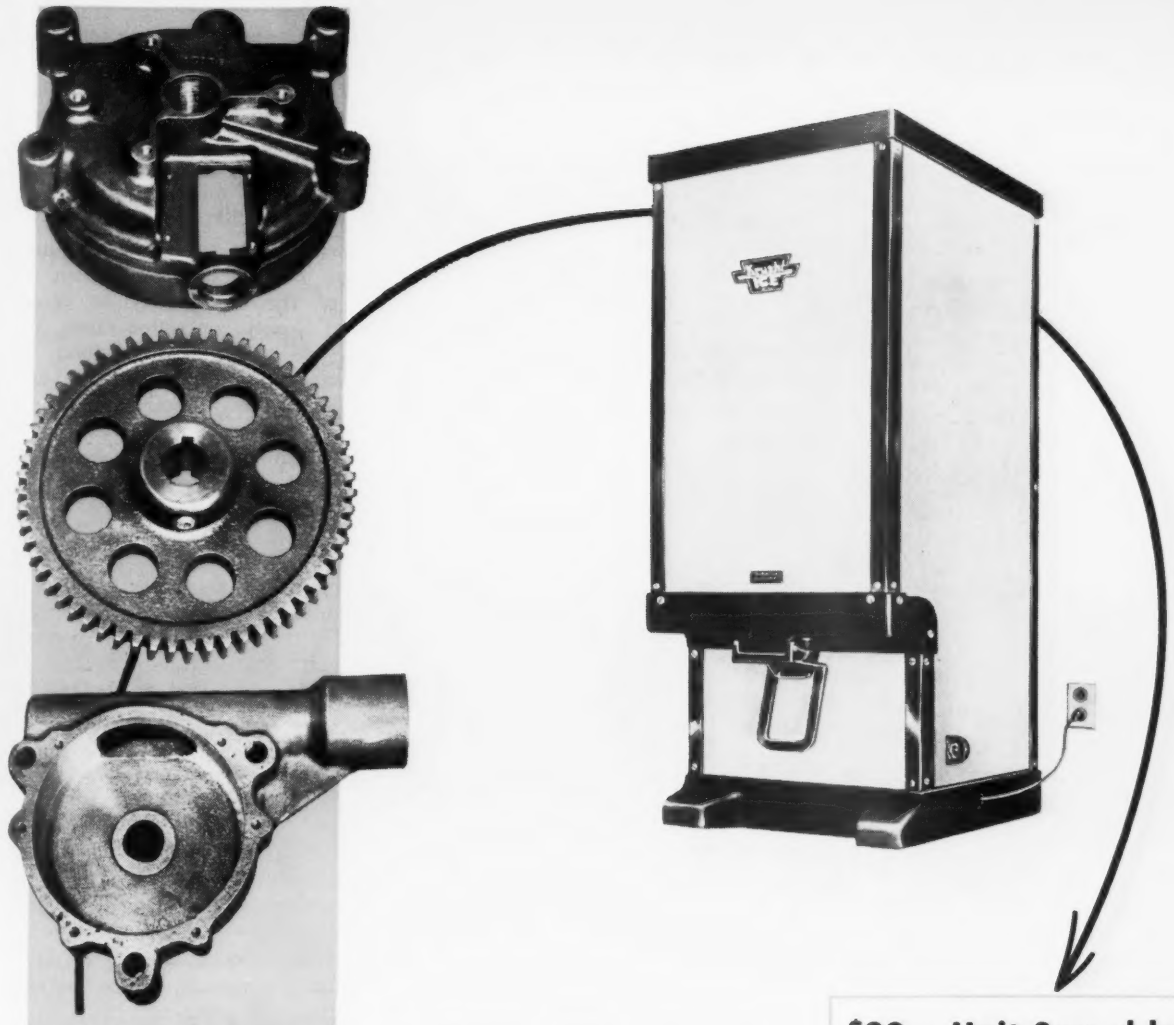
He stressed the fact that engineering design, weight, strength ratio, machinability, weldability and eye appeal are very important in reducing the number of rejects. The meeting was concluded with a question-and-answer period.—*Henry M. Witmyer Jr., Foundry Service & Supply Co.*

Northwestern Pennsylvania

A CAPACITY crowd filled the Blue Room of the Moose Club, Erie, Pa., for the regular March meeting of the Northwestern Pennsylvania Chapter of the AFS. Charles F. Gottschalk, Cascade Foundry Co., chapter chairman, returned from three months in Florida and presided at the meeting.

Bailey D. Herrington, Hickman, Williams & Co., program chairman, introduced Thomas E. Barlow, sales manager, Eastern Clay Products Department, International Minerals & Chemical Corp., Chicago, as guest speaker. Mr. Barlow spoke on "High Pressure Molding." He traced the techniques of molding from the ancients, stressing that little change had been made until the last few years when the "C" and "D" proc-

(*Continued on page* 238)



Ice-Shaver Price-Shaver...

$30 a Unit Saved by SHELL MOLDING

Estimated savings of $30 a unit are the result of casting parts for this ice crusher in shell molds bonded with BAKELITE Phenolic Resins. Facing, boring, reaming, countersinking, and milling are some of the steps that have been eliminated from production of the aluminum pieces.

Gases escape easily through shell molds, so castings from both ferrous and non-ferrous alloys have negligible porosity. The metal cools slowly, forming a skin-smooth surface, with almost complete absence of scale. There are no sand pockets, which are so hard on tooling when machining is needed.

BAKELITE Resin BR-12011S was used for the shell molds that made these castings. It's specially formulated to give more leeway in curing time. Molds made with this resin reach minimum usable strength faster and retain it longer at curing temperatures. In addition, they are highly resistant to warping on ejection from the pattern plate, so mold halves are matched more closely, making castings more accurate.

These economic advantages for your foundry operations can result from the use of shell molding with BAKELITE Phenolic Resins. Write Dept. XL-29.

Data courtesy **Brockman Tool & Mfg. Co.**, Bala-Cynwyd, Pa.

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(*Continued from page* 236)
esses and now the "High Pressure Process" have been instituted, which, according to Mr. Barlow, can be adopted in most foundries at a very nominal cost.—*Roy A. Loder, Erie Malleable Iron Co.*

St. Louis

HIGHLIGHT of the Mar. 11 meeting of St. Louis District Chapter of the AFS was a talk by Clyde L. Schwyhart, education and training manager, Caterpillar Tractor Co., Peoria, Ill., and the awarding of prizes to winners of the local AFS apprentice contest. Dale Arnette, Arnette Pattern Co., Granite City, Ill., apprenticeship chairman, made the presentations.

Featured speaker was introduced by Ralph M. Hill, East St. Louis Castings Co., who was technical chairman for the meeting. Mr. Schwyhart spoke on "Industrial Training Values," discussing the importance of training and how it passes on to each succeeding generation the benefits of the experience of preceding generations. It is not enough to record our experience since there are many jobs that cannot be mastered without actual demonstration.

The speaker pointed out that the old philosophy—a man must work to survive—no longer holds true; therefore, industry must sell itself to the worker if it is to get the help it requires. Mr. Schwyhart then outlined the procedure followed at Caterpillar in selecting and training employees, and offered suggestions that his listeners might apply to their own operations.

The important part played by supervisors in the successful operation of a plant and the qualities that make for good supervision were discussed at some length.

A crowd approaching capacity was at the Apr. 8 meeting to hear T. E. Barlow, sales manager, Eastern Clay Products Department, International Minerals & Chemical Corp., Chicago, speak on "High Pressure Molding" at the regular meeting of the St. Louis District Chapter of AFS.

According to the speaker, high pressure molding has come about because of the availability in recent years of closely controlled sands. Mr. Barlow described the method as green sand molding using a fine, uniform sand, close pattern tolerances and harder ramming. The result is a casting with smoother finish, closer dimensional tolerances and the absence of swells and strains. High pressure molding has resulted from the increasing demand on the foundry industry for smoother finish and closer tolerances. However, he stated, there are many problems to be overcome and time will be required to perfect this latest casting method.

The nominating committee composed of Norman Peukert, chairman;

(*Continued on Page* 240)

ST. LOUIS Chapter of the AFS met Mar. 11 to hear Clyde L. Schwyhart, Caterpillar Tractor Co., Peoria, Ill., speak on "Industrial Training Values," and to award prizes to the apprentice contest winners in patternmaking and molding. Top view shows Mr. Schwyhart addressing the chapter. Center view depicts winners of the competition in the patternmaking and molding divisions of the contest. Bottom view pictures the wood patternmaking division winners

TACCONE DIAFORM MOLDING MACHINE

makes available now to every foundry

- ☆ High Pressure Molding
- ☆ High Speed Operation
- ☆ Low Machine and Pattern Equipment Maintenance

TACCONE PRINCIPLE

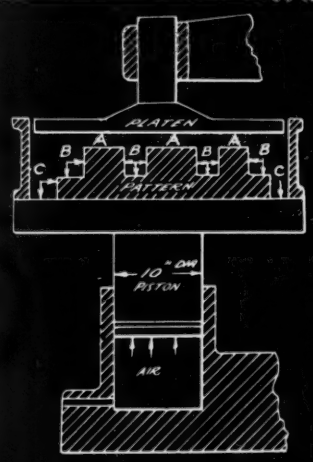
Pressure surface of diaphragm on sand is approx. 40% greater than the area of the flask

Flask size = 12" x 18"
Area = 216 sq. in.
216 + 40% = 302 sq. in.
302 sq. in. x 80# line pressure = 24,160#

24,160 pounds total pressure on sand

A—DENSITY OF RAM ESSENTIALLY IDENTICAL AT ALL POINTS

80 LB. LINE PRESSURE



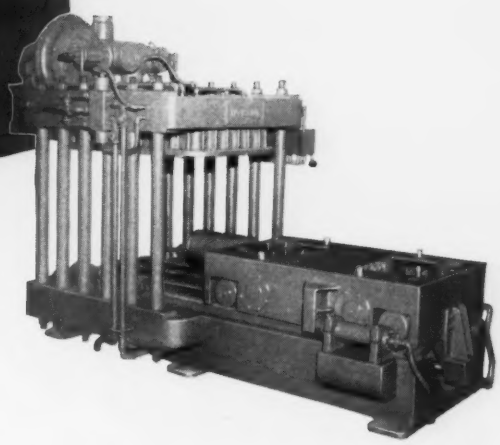
CONVENTIONAL SQUEEZE

A—HARD RAM
B—MEDIUM RAM
C—SOFT RAM

6,280 pounds total pressure on sand

Area of 10" dia squeeze piston = 78.5 sq. inches. 78.5 x 80# line pressure = 6,280#

- HIGH PRESSURE MOLDING
- PRECISION CASTINGS
- LOWER PATTERN COST
- FASTER MOLDING
- LESS FLASK MAINTENANCE
- MOLD HARDNESS CONTROL
- UNIFORM MOLD HARDNESS
- LOWER COST MOLDING
- LESS AIR CONSUMPTION



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"Taccone Diaform Molding Machine"

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MEXICO CITY Chapter of the AFS met Mar. 12 to install officers and hear a talk, "My Experiences in Several American Foundries," by Francisco Diaz Covarrubias, metallurgist, La Consolidada, S. A. Photograph shows the officers for the current year. Mr. Covarrubias appears at the extreme left

(*Continued from page* 238)

R. M. Hill, H. W. Meyer, and W. L. Kammerer, announced the following nominations: Chairman, Fred J. Boeneker, Bronze Alloys Co., St. Louis; vice chairman, George L. Mitsch, American Car & Foundry Co., St. Louis; secretary, Paul E. Retzlaff, Nordberg Mfg. Co., St. Louis; and treasurer, Russell E. Hard, St. Louis Coke & Foundry Supply Co., St. Louis. Directors nominated to serve three years include: W. L. Kammerer, retiring chairman; A. O'Hare, J. R. Bodine Jr., and F. Hatten.—*J. R. Bodine Jr., Bodine Pattern & Foundry Co.*

Washington

APRIL meeting of Washington Chapter of the AFS was held at the Poodle Dog Cafe, Tacoma, Wash. Officers elected for the coming year are: Chairman, James N. Wessel, Puget Sound Naval Shipyard, Bremerton, Wash.; vice chairman, William A. Shang, South Seattle Foundry, Seattle, Wash.; program chairman, Harold R. Wolfer, Puget Sound Naval Shipyard, Bremerton, Wash.; secretary, Fred R. Young, E. A. Wilcox Co., re-elected; and treasurer, Vernon W. Rowe, Ballard Brass & Pattern Works, re-elected.

Plans to hold the chapter's annual outing at Five-Mile Lake on Aug. 21 were announced.

Principal speaker was E. J. McAfee, master patternmaker, Puget Sound Naval Shipyard, whose subject was "What Is New in Patternmaking, and the Obligation of the Patternmaker to the Foundryman." The pattern is a tool for foundrymen, Mr. McAfee stated, and it should be made with every consideration for meeting their needs. He also recommended the use of models on intricate casting jobs as a means of saving time and money in solving molding problems.

In conclusion he displayed samples of several new woods available. Corisa wood comes from Brazil and is priced competitively and compares with pine. A dense hardwood now available from Peru compares with mahogany for pattern material. He then reported he is working with new epoxy casting resins which have proved to be dimensionally stable and offer great promise as a plastic patternmaking material.—*Harold R. Wolfer, Puget Sound Naval Shipyard*

TENNESSEE Chapter of the AFS met March 19 in Chattanooga at the Hotel Patten to hear a talk on "Core Room Mechanization," by C. V. Nass, Beardsley & Piper Division, Pettibone Mullikin Corp., Chicago. Seated left to right, are W. M. Hamilton, Crane Co.; Mr. Nass; and W. P. Delaney, Eureka Foundry Co., chapter chairman. Standing, from left to right, are Herman Bohr, Robbins & Bohr, who introduced the speaker, and Charles Chisholm, Wheland Co.

Mexico City

MEXICO City Chapter of the AFS met in Mexico City Mar. 12 to install officers and hear a talk by Ing. Francisco Diaz Covarrubias on "My Experiences in Several American Foundries.'"

Chapter officers for the current year are: Chairman, N. S. Covacevich, La Consolidada, S. A.; vice chairman, Urbana Opez Ayala; secretary-treasurer, Luis Delgado Vega, Cia. Proveedora de Industries. S. A. Directors are F. Gonzalez Vargas, Teziutlan Copper Co., Enrique Varela, Fundiciones de Hierro y Acero, S. A., Juan Latapi Sarre, Fundiciones de Hierro y Acero, S. A.; Francisco Diaz Covarrubias, La Consolidada, S. A., Frank Madrigal, Fundicion de Aceros Tepeyac, S. A., Pedro Torres, Carlos Taffinder, Fabricacion de Maquinas, S. A., and Enrique Alquicira. —*N. S. Covacevich*

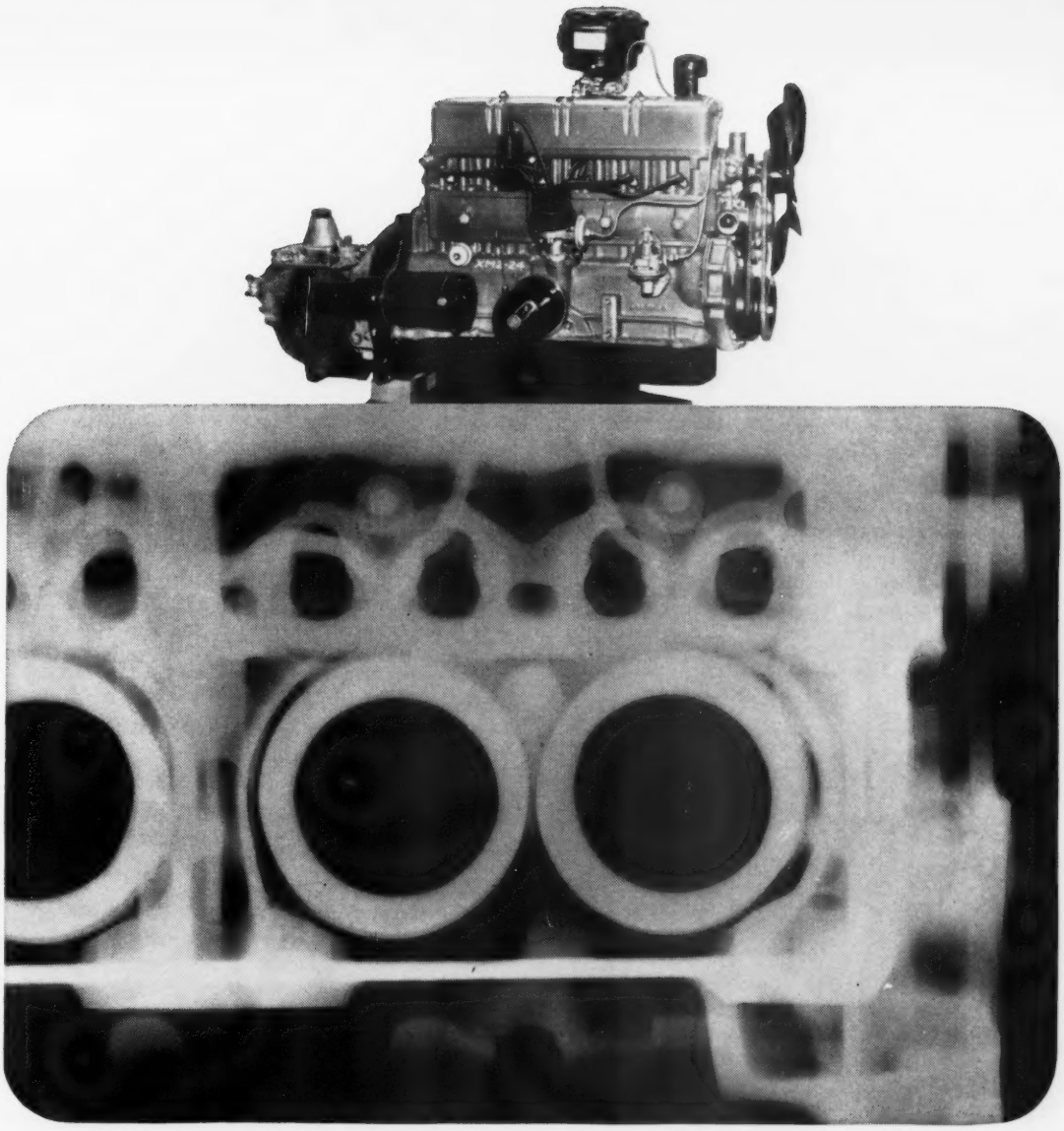
Connecticut Non-Ferrous

SPEAKER at the Mar. 17 meeting of Connecticut Non-Ferrous Foundrymen's Association, was T. E. Barlow, sales manager, Eastern Clay Products Department, International Minerals & Chemical Co., Chicago, whose subject was "Pressure Molding." The meeting was held at the Quinnipiack Club, New Haven, Conn.

According to Mr. Barlow, pressure molding is simply an extension of regular green sand molding with the use of fine controls to attain castings of superior surface finish and finer tolerances. Pressures vary from 80 to 600 psi depending on the work and quality desired. A feature of pressure molding is that conventional equipment can be used with but minor adjustments. Synthetic sands of 90 to 110 AFS fineness are favored. Partly rounded or sub-angular grains are desired to help needed flowability. Best results have been found with sands having a fairly wide screen distribution.

Moisture is held to the minimum needed for the job and usually is

(*Continued on page* 242)



Production line "bugs" get X-RAYED out on the pilot model

MASS production of car engines calls for a continuous run of castings as uniformly sound as it's possible to pour. No sand holes. No gas holes. No core shifts.

Manufacturers take care of that early in their plans. They radiograph pilot castings—can spot thin walls, "out-of-rounds," and other irregularities which a change in casting procedure can forestall.

Improving yield is one of the reasons more and more foundries are making radiography routine. It is the one way to be sure only high-quality work is released.

Radiography can improve your plant operation. How? Your x-ray dealer will tell you. Or, we'll send you a free copy of "Radiography as a Foundry Tool."

EASTMAN KODAK COMPANY
X-ray Division, Rochester 4, N. Y.

Radiography...

another important example of Photography at Work

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(*Continued from page* 240)
under 3 per cent. Some jobs, however, have been run with sands containing zero moisture. Dry resin additives are sometimes used to help sand strength, but most work can be handled with merely additions of southern bentonite. — *John V. McCarthy, Vesuvius Crucible Co.*

Northeastern Ohio

MEMBERS of Northeastern Ohio Chapter of the AFS enjoyed a varied program Apr. 8 at the Tudor Arms Hotel, Cleveland. Stephen E. Kelly, Eberhard Mfg. Co., chairman, presided. Coffee speaker was Lou Groza, place-kicking specialist of the Cleveland Browns football team. He discussed aspects of professional football and showed a film highlighting Browns' games on the 1953 schedule. Lewis T. Crosby, Sterling Wheelbarrow Co., was coffee chairman and introduced the speaker.

Winners of the apprentice contests sponsored by the Cleveland Trade School and the Pattern Manufacturers Group of the Associated Industries of Cleveland attended as guests of the chapter and received their prizes. John F. Roth, Cleveland Standard Pattern Works, presented awards to Steve Simon, Master Pattern Co.; Lewis Backus, Cleveland Standard Pattern Works, and Charles Reimer, Advance Pattern Co., first, second and third prize winners, respectively, in wood patternmaking. He also presented awards to Herbert Tidik, Ford Cleveland Foundry; John Bolibrush, Motor Patterns Co., and Jack Shimandle, Ford Cleveland Foundry, first, second and third, respectively, in metal patternmaking.

Warren R. Johnson and Leroy Pike, both from Eberhard Mfg. Co., were first and second prize winners, respectively, in the steel and malleable patternmaking contest. In gray iron patternmaking, Sam Simeone and Isaiah Doll, both from Hill Acme Co., were first and second prize winners, and Raymond C. Lea, Fulton Foundry & Machine Co., won third prize. These awards were presented to the apprentices by John Davenport, Fulton Foundry & Machine Co.

Fred J. Pfarr, Lake City Malleable Co., nominating committee chairman, submitted the proposed slate of officers for 1954-1955. David Clark Jr., Forest City Foundries Co., was nominated for chairman; Lewis T. Crosby, Sterling Wheelbarrow Co., first vice chairman; Alexander D. Barczak, Superior Foundry Inc., second vice chairman; Harold R. Strater, North American Refractories Co., treasurer, and Howard Heyl, Federal Foundry Supply Co., secretary. Stephen E. Kelly, present chairman was nominated for a one-year term on the board of directors, as was Charles F. Walton, Gray Iron Founders' Society. Emil J. Romans, Na-

(*Continued on page* 244)

NORTHEASTERN OHIO Chapter of the AFS met at the Tudor Arms Hotel, Cleveland, Apr. 8. Top left are award winners in the chapter's apprentice contest, with F. C. Cech, Cleveland Trade School, contest chairman, extreme left, front row. Center, left to right, are Lou Groza, Cleveland Browns, coffee speaker; S. E. Kelly, Eberhard Mfg. Co., chairman; Edwin Bremer, *Foundry*; A. D. Barczak, Superior Foundry Inc.; Dave Clark Jr., Forest City Foundries Co.; R. A. Witschey, A. P. Green Fire Brick Co., Chicago, technical speaker, and G. J. Nock, Nock Fire Brick Co. Bottom, left to right, are D. C. Cartwright Cleveland Trade School; L. T. Crosby, Sterling Wheelbarrow Co.; H. R. Strater, North American Refractories Co.; A. J. Harlan, Hickman, Williams & Co.; J. F. Roth, Cleveland Standard Pattern Works, who presented wood and metal pattern contest awards; Harvey Ennis, Associated Industries of Cleveland, and John Davenport, Fulton Foundry & Machine Co., who presented steel, malleable iron and gray iron pattern contest awards. Photographs are by the courtesy of Sterling N. Farmer, Sand Products Corp.

Here's part of the secret of R. H. Osbrink's process

Close tolerance casting in West Coast plant aided by processing cores in Foundromatic dryer

The R. H. Osbrink Manufacturing Company, Los Angeles, has a well-deserved reputation for precision and flawless casting of metals. Castings in which internal cored finishes are 100 or better micro-finish, and castings with a wall thickness of 0.100 inch are routine.

What's the secret of this precision?

Men who have studied the R. H. Osbrink Co. operations say it is a passion for detail . . . and up-to-date equipment.

One example is the modern Allis-Chalmers dielectric sand core dryer. It helps solve two major problems.

1. It provides cores with high dimensional stability — no sag, no slump.

2. It provides cores with smooth surfaces for fine-finish castings.

In addition, the *Foundromatic* dryer cuts core drying time from hours to minutes and reduces handling time.

Get complete information on the *Foundromatic* dryer by calling your nearby Allis-Chalmers office. Or send for Bulletin 15B7306C. Allis-Chalmers, Milwaukee 1, Wisconsin. A-4365

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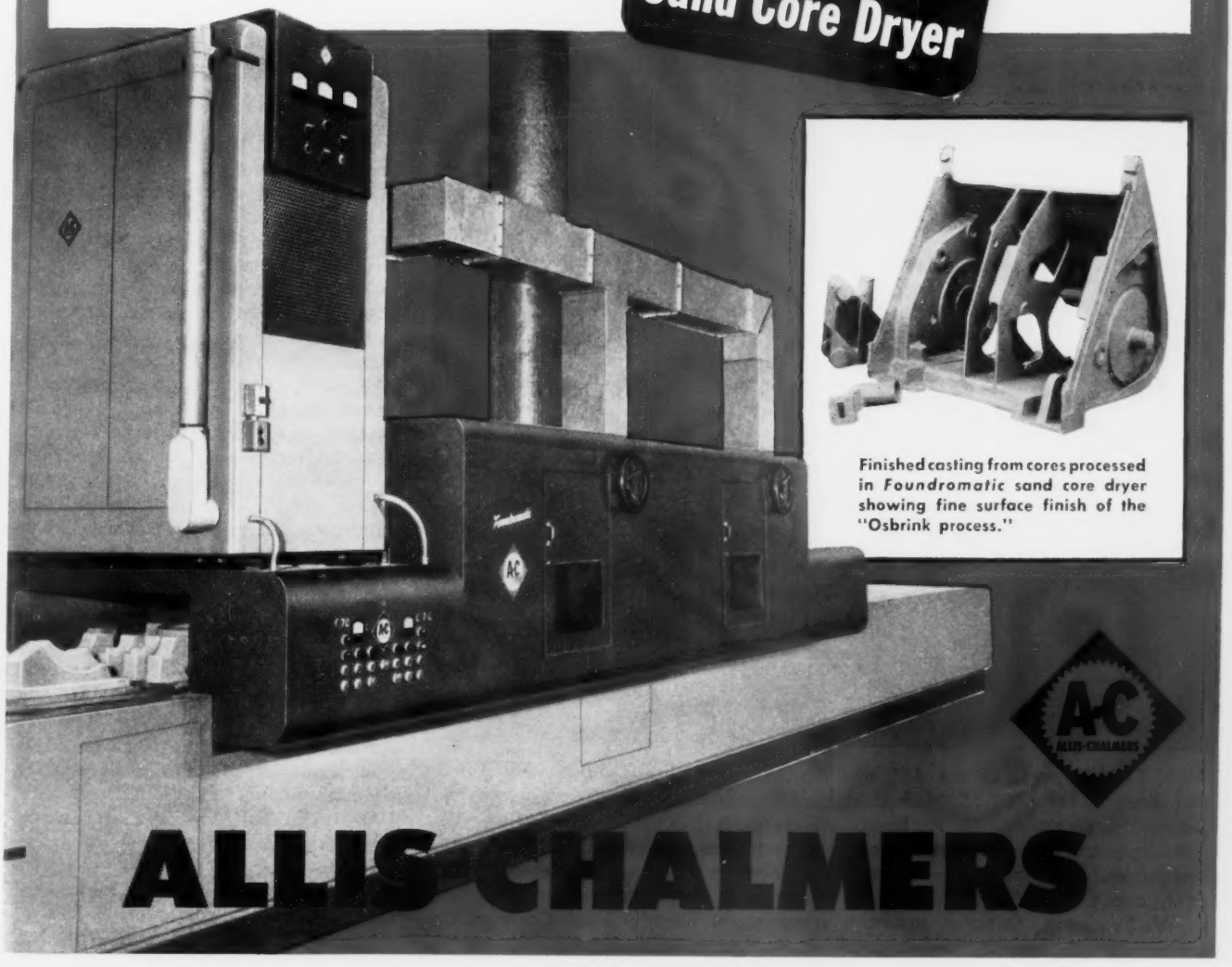

Finished casting from cores processed in *Foundromatic* sand core dryer showing fine surface finish of the "Osbrink process."

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

METROPOLITAN Chapter of the AFS met April 6 at Newark, N. J., to honor the winners of the chapter's apprentice contest. Left to right are George Begala, American Brake Shoe Co., Mahwah, N. J., first place award, and George Rodrigues, Barnett Foundry, Irvington, N. J., second place. Photo courtesy John Bing, Metropolitan Refractories Corp.

(*Continued from page* 242)

tional Malleable & Steel Castings Co.; Wayne C. Johnson, Walter Best Inc.; John Davenport; E. R. Crosby, Smith Facing & Supply Co., and Albert S. Johnson, Lake City Malleable Co., were nominated for three-year terms on the board.

Technical speaker for the evening was Ray A. Witschey, A. P. Green Fire Brick Co., Chicago, who presented a 30-minute color film, "Master of Fire—Servant of Industry." The film depicts methods and procedures used by A. P. Green Fire Brick Co., Mexico, Mo., in mining, processing, firing, inspecting, packaging and shipping various types of the 80 million refractories it produces annually. Because of the length of the program, there was a limited discussion of the film and related refractory problems. Mr. Witschey did offer a word of advice on the choice of refractories, however, by stating it probably is best and safest to pick a refractory according to ASTM standards. As refractories are made in so many forms, physically and chemically, reliance upon such an accepted standard will eliminate chances for error in selection. Gilbert J. Nock, Nock Fire Brick Co., was technical chairman and introduced the speaker.

At the pattern division meeting, John Roth, Cleveland Standard Pattern Works, presided over a round-table discussion in which the 25 persons present participated. Subjects discussed ranged from new pattern materials to the proper training of pattern apprentices. — *Kenneth L. Mountain and Jack C. Miske*

TWIN CITY Chapter of the AFS met Apr. 13. Top view shows new officers and directors for 1954-55. Left to right: Edward Sitartz, Prospect Foundry Co., director, three years; H. H. Blosjo, Minneapolis Electric Steel Castings Co., vice chairman; J. J. Upgren, Northern Ordnance Inc., director, three years; and A. W. Johnson, Northern Malleable Iron Co., chairman. Below, left to right, are O. J. Myers, Archer-Daniels-Midland Co., chapter chairman, and C. W. Sundberg, research assistant, Minneapolis Electric Steel Castings Co., speaker for the evening. Photos by R. J. Mulligan, Archer-Daniels-Midland Co.

Twin City

OFFICERS for the 1954-55 chapter year were elected during the Apr. 13 meeting of Twin City Chapter of the AFS. A. W. Johnson, Northern Malleable Iron Co., St. Paul, is newly elected chairman; H. H. Blosjo, Minneapolis Electric Steel Castings Co., Minneapolis, is vice chairman.

Directors elected to serve three years include: R. M. Overstrud, Minneapolis-Moline Co., Minneapolis; Edward Sitartz, Prospect Foundry Co., Minneapolis; J. J. Upgren, Northern Ordnance Inc., Minneapolis.

Principal speaker for the meeting was Carl W. Sundberg, Minneapolis Electric Steel Castings Co., whose paper was entitled "Better Casting Finish through Tighter Sand Control." Mr. Sundberg described production techniques at his shop. Basically, closer sand control centers around raw materials and process control.

Raw materials control, principally sand, may be obtained through specifications for suppliers. These should be written on the basis of each screen limit, clay content and grain fineness number. Mr. Sundberg reported a good workable correlation between many phases of foundry practice and their effects on sand flowability as measured by deformation testing. Once the sand mixture has been standardized and flowability of the mixture determined by deformation measurements, limits of deformation then can be established for successive batches.

This type of control testing not only reflects changes in the make-up of the sand mixture, but it also will

(*Continued on page* 246)

Bay State Grinding Wheels

. . . are SAFE Wheels

Constantly higher grinding wheel safety factors have developed from BAY STATE'S 32 years of grinding wheel progress.

Pioneers in the field of scientific grinding wheel reinforcement, BAY STATE research found the secrets of adding functional strength to the natural sharpness of abrasive products.

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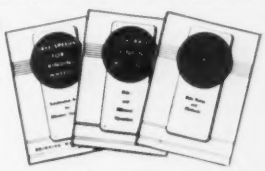

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DETROIT Chapter of the AFS held a panel discussion on molding methods at its Apr. 15 meeting. Participants, shown from left to right above, were E. E. Woodliff, Foundry Sand Service Engineering Co., on green sand; Harold G. Sieggreen, Central Foundry Division, General Motors Corp., on shell molding; O. J. Myers, Archer-Daniels-Midland Co., on the "D" process; T. E. Barlow, Eastern Clay Products Department, International Minerals & Chemical Corp., on pressure molding; and C. W. Hockman, Cadillac Motor Co., moderator

(*Continued from page* 244)
be sensitive to mechanical changes in the handling of sand. Mulling time, for example, effects a change in the deformation of the sand. An inefficient muller thereby is exposed, and correct mulling time can be established.—*R. J. Mulligan, Archer-Daniels-Midland Co.*

Detroit

PRIZES were presented to winners of the apprentice patternmaking contest during the Mar. 18 meeting of Detroit Chapter of the AFS. Boys who had entered the contest were guests of the chapter for the meeting. The prizes were presented by Paul Copeland, Ford Motor Co.

Winners of the wood patternmaking section included: First place, Sheldon Haglund, Allied Pattern Works; second place, Andrew Young, Wett Laufer Pattern; third place, Gilbert Parkinson, City Pattern Foundry & Machine Co. In the contest for metal patterns, the winners were: First place, Bill Kaseta, City Pattern Foundry & Machine Co.; second place, John Molner, Peerless Pattern Co.; third place, William Piotrowski, City Pattern Foundry & Machine Co.

The chapter extended special thanks to Mr. Copeland, chairman of the pattern contest and to his co-chairman, Vaughan C. Reid.

Technical discussion featured Robert W. Gardner, manager of quality control of the Dearborn Iron Foundry, Ford Motor Co., whose subject was "Quality Control in the Foundry." In his talk Mr. Gardner pointed out how quality control can be applied to small as well as to large foundry operations. Slides illustrated his presentation.

In addition, the Ford Motor Co. film, "Techniques of Tomorrow," describing operations at the Cleveland Ford Foundry, was shown.—*R. Grant Whitehead, Claude B. Schneible Co.*

Boston

MEMBERS of Boston Chapter of the Non-Ferrous Founders' Society met Mar. 18 to hear T. E. Barlow, sales manager, Eastern Clay Products Department, International Minerals & Chemical Corp., Chicago, speak on "Pressure Molding."

Mr. Barlow described the equipment used with the process and stated that a heavy rubber diaphragm actuated by air pressure is employed over the molding machine head to give a contoured squeeze rather than the usual straight-line squeeze. This rubber diaphragm helps to tuck the sand into pattern recesses and thus attains more uniform mold density than is possible with the conventional squeeze.

For good pressure molding, ample size flask equipment should be planned. Positioning the pattern too close to the flask wall makes it difficult for the rubber diaphragm to tuck the sand effectively. The uneven and sometimes arched mold surface given by the contour squeeze causes no trouble, even in the drag. If a level surface is desired, however, it can be had by molding more sand than is needed and striking off the excess.—*John V. McCarthy, North American Smelting Co.*

San Antonio

THREE films were featured at the Apr. 19 meeting of the San Antonio section of the Texas Chapter of the AFS. About 42 members and guests attended the meeting, held at the Alamo Iron Works.

The film "Safety in the Foundry Industry" was presented through the courtesy of Aetna Life Insurance Co. The other films, "Powder Cutting" and "Scarfing and Washing of Castings," were made available through the courtesy of Al Bernson, Linde Air Products Co.

Refreshments for the social hour were sponsored by the San Antonio Machine & Supply Co.—*Edw. W. Pruske, Alamo Iron Works*

NORTHERN CALIFORNIA Chapter of the AFS met Apr. 12 at Hotel Shattuck, Berkeley, Calif., to hear George B. McMeans, vice president in charge of operations, Kaiser Steel Corp., Fontana, Calif., discuss blast furnace and open hearth operation and the making of pig iron. In the illustration above, Mr. McMeans, in the center, is discussing his subject with local chapter members

Rochester

ROCHESTER Chapter of the AFS met Apr. 6 at the Seneca Hotel, Rochester, to hear Hans J. Heine, technical director of the AFS, speak on the "Foundrymen's Most Unused Tool."

The nominating committee announced the following slate of officers to serve during 1954-55: President, Duncan M. Wilson, American Brake Shoe Co.; secretary-treasurer, Charles D. Loomis, General Railway Signal Co.; directors, Edward J. Baker, Federated Metals Division, American Smelting & Refining Co., Arthur Spindler, City Pattern Works, and Herbert Senger, Ritter Co. Election of officers was held at the May meeting.

(*Concluded on page* 248)

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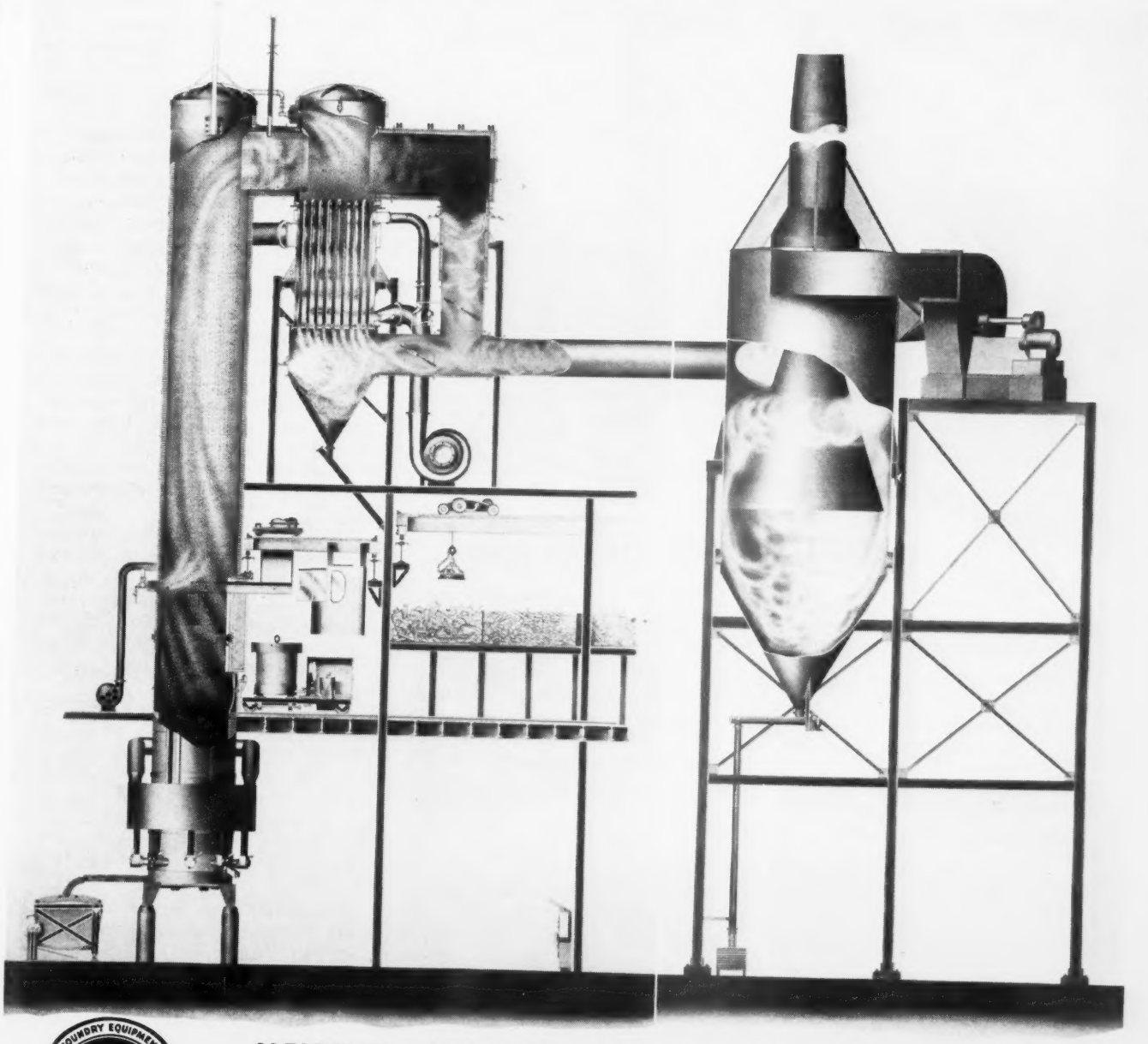

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(*Concluded from page* 246)

Mr. Heine stated that education is paramount to progress and that the AFS has been and always will be interested in all levels of education for the benefit of the foundry industry. The progressive foundryman, Mr. Heine said, will avail himself of the latest mechanical equipment and technological knowledge available so as to better take advantage of the unlimited opportunities confronting today's industry.

Mr. Heine urged foundrymen to believe in themselves, think, and reevaluate things as of today, giving up the hallowed traditions of the past. — *H. G. Stellwagen, Hetzler Foundries Inc.*

Wisconsin

WISCONSIN Chapter of the AFS met Apr. 9 at Hotel Schroeder, Milwaukee. Chapter President A. F. Pfeiffer, Allis-Chalmers Mfg. Co., announced the new officers for the coming year as follows:

President, Robert V. Osborne, Lakeside Malleable Castings Co., Racine, Wis.; vice president, P. C. Fuerst, Allis-Chalmers Mfg. Co.; secretary, I. R. Hutchinson, Nash-Kelvinator Co., Kenosha, Wis.; and treasurer, Bradley Booth, Carpenter Bros., Milwaukee. Directors chosen for three-year terms are: George I. Gilson, J. E. Gilson Co., and Clarence A. Gehrman, Sterling Wheelbarrow Co.

Following the dinner, sectional meetings were held with discussion periods after each talk. In the steel section, R. M. Massenberg, United States Steel Corp., talked on "Fundamentals of Safety." Dick S. Boxma, Bucyrus-Erie Co., acted as chairman.

Gray iron group held a roundtable information forum with Prof. R. W. Heine, University of Wisconsin, acting as moderator. The panel consisted of members of the gray iron committee of the chapter. H. W. Schwengel, Modern Equipment Co., Port Washington, Wis., was chairman.

Malleable iron section heard Robert Schauss, Werner G. Smith Inc., Chicago, talk on "Malleable Core Practice," with Don Feather, Wisconsin Appleton Co., South Milwaukee, acting as chairman.

The nonferrous section talk was presented by D. L. Day, Badger Fire Brick Co., on the subject of "Master of Fire—Servant of Industry." Carl Van Buren, Milward Alloys Co., acted as chairman for this group.

The Pattern group listened to Mel Young, U. S. Gypsum Co., speak on "Patternmaking with Hydrocal."— *John E. Hubel*

Feeding Characteristics

(*Continued from page* 115)

of riser solidification, the start of eutectic formation at the surface and the completion of the eutectic reaction at the center.

Each of the riser series shows the start of expansion at a common time which corresponds to the time of start of eutectic reaction at the surface of the casting. For the case of the 3-in. risers which capped (the term "capped" will be used to denote freezing of the riser surface) at approximately the time of eutectic start at the surface of the casting, the expansion continues rapidly until the casting is solidified.

The 4-in. risers which capped at about the half-time of eutectic reaction travel through the casting cross section show less expansion. The 5 and 6-in. risers which remained open during the entire period of travel of the eutectic waves through the casting show very slight expansion. As illustrated by Fig. 13, no purging is observed for the 3-in. riser which capped at the time of eutectic start, whereas for the 4, 5 and 6-in. risers the amount of purging increased in proportion to the capping time of the riser. No significant differences in the amount of purging were observed due to the different sands.

Pressure Causes Expansion

Analyzed collectively, these data indicate that the gray iron castings expand because of internal pressure generated by the eutectic reaction. Open risers provide hydraulic relief by allowing reverse flow of feed metal; conversely, capped risers cause pressurization of the casting, with resultant pushing outward of the weak casting walls, as illustrated schematically in Fig. 14. System "A" represents a condition of early capping of the riser and System "B" a condition of risers which remain open during the solidification of the casting.

Free flow of feed metal is possible at all stages of solidification of gray iron castings; that is, as predicted by solidification studies, the interdendritic channels remain filled with liquid metal. Because of the feed metal surplus developed as the result of expansion during eutectic reaction, positive feeding was assured, and the casting contained no shrinkage regions, even in the 3-in. riser system.

The results of similar experiments for a nodular iron of equivalent composition are summarized in Figs. 15 and 16. Again it is noted that expansion starts at the time that eutec-

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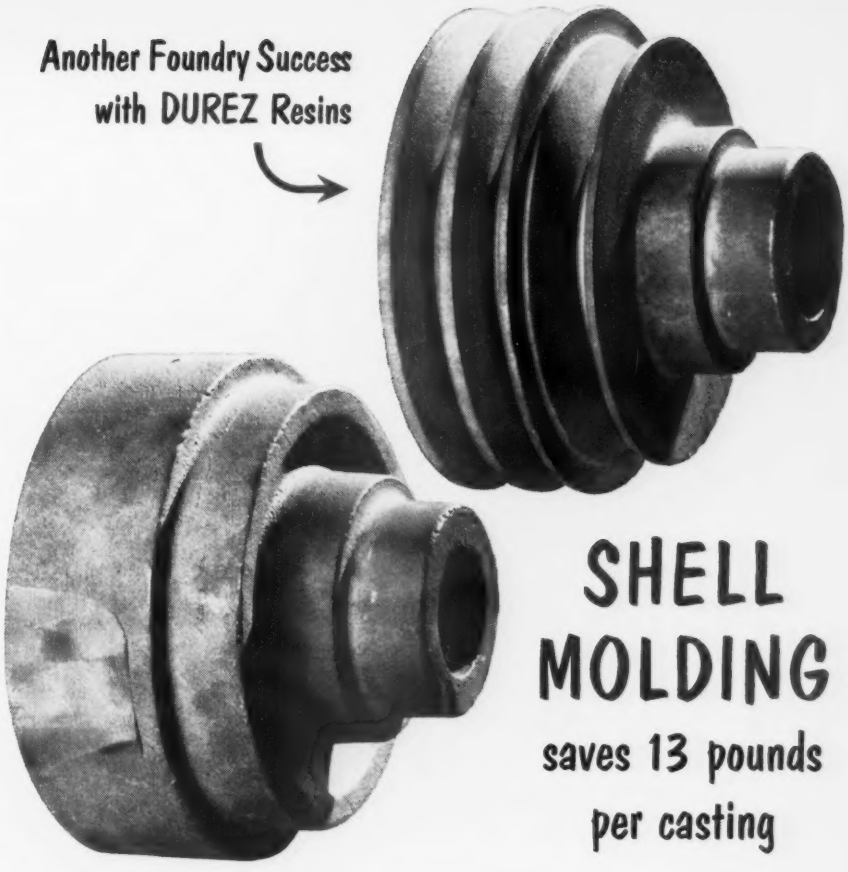

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One of the advantages of shell molding is evident in these multiple V-belt pulley castings. When made by green sand method the casting weighed 40 pounds before machining (left), while the unmachined shell molded casting (right) weighs only 27 pounds. On the latter the only surfaces to be machined are the V in the pulley and one face.

This pulley is one of several grey iron castings now being produced in shell molds by the Brillion Iron Works, Brillion, Wis., for one of their customers. Brillion uses Durez 16170, a resin with very fast cure and rigid set, and reports that this resin has helped them eliminate the shell warpage they used to get.

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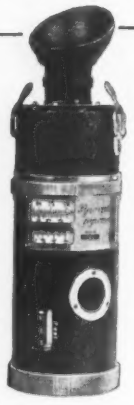

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tic reaction begins at the surface and ends when the eutectic end of the freeze wave reaches the center. However, the effects of riser size are reversed; that is, more pronounced expansions are obtained with large risers. The 5 and 6-in. risers which remained open during the solidification of the casting resulted in large and essentially equal expansion. These castings were completely sound. The 3 and 4-in. risers which solidified in advance of the casting resulted in less expansion than observed for the large risers. The castings contained internal shrinkage as illustrated in Fig. 15. No purging was observed in any case.

These data indicate that the free flow of feed metal in nodular iron castings comes to an end soon after the eutectic reaction spreads through the casting. This is in keeping with the eutectic reaction characteristics of nodular iron as explained previously and illustrated schematically in Fig. 9. Unlike flake iron, which has a narrow band eutectic reaction with single stage transformation features, the nodular iron eutectic reaction spreads over wide regions of the casting and proceeds in two stages.

Carbide Blocks Feed Paths

The first stage, involving the development of carbide structures, results in blocking of feed metal paths. The second stage of malleabilization of the carbide with consequent growth of spherulites may develop pressures which expand the casting but cannot cause the reverse feed metal flow which characterizes flake irons.

Reverse feed metal flow of flake irons may be expected not only to cause purging, but also to cause refilling of shrinkage regions developed during the time of dendrite formation. For nodular irons such refilling should not be possible. The fact that the 3 and 4-in. risers for the nodular castings developed less expansion than that observed for the 5 and 6-in. risers possibly may be explained by the presence of internal shrinkage in the smaller risers. A large central void and associated general spongy area could be considered as an internal casting wall which accepts part of the expansion movement; that is, the expansion of the outer wall is decreased because of the plastic metal in the direction of the void.

Shrinkage Void Formation—Experiments were conducted to establish the timing of the formation of gross shrinkage in the nodular iron with relation to the solidification conditions of the casting. Similar tests were conducted for the gray iron to

(*Continued on page* 252)

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Material Handling Equipment

(*Continued from page* 250)

determine if the mechanism of formation and refilling of the void could be demonstrated.

Fig. 17 illustrates the method used to time the formation of the void and the test results obtained. A water manometer was connected to the end of two silica tubes inserted at the position of the shrinkage void for a 3-in. diam riser casting (same casting used for dilation studies). One of the tubes was closed and the other was open, except for a sand filling used to prevent the entry of liquid iron. The closed tube provided for equalization of initial pressure caused by expansion of air resulting from the heating of the tubes. The low total heat capacity of the tubes prevented the development of a solid skin over the surfaces. A thermocouple was placed near the tubes to record the propagation of solidification at the position of shrinkage.

Vacuum Develops

The manometer liquid displacement data (pressure curves) show the development of a vacuum, indicating the start of a void at the time that the cooling curves showed approximately half completion of dendrite formation. For the nodular iron the displacement of the manometer liquid continued to the end of the dendrite formation period, indicating enlargement of the void, and then stabilized, indicating that the void reached final size and that no refilling of the cavity occurred during the eutectic reaction interval.

For the gray iron, a sharp reversal in the direction of travel of the manometer liquid at the time of eutectic reaction indicated refilling of the void with eutectic liquid. The castings were sectioned and, as illustrated in Fig. 18, the nodular iron showed a shrinkage cavity at the tube position; the gray iron casting was perfectly sound. These tests were repeated several times with the same results.

Conclusions—The relationships of solidification and feed metal flow characteristics of hypoeutectic gray and nodular irons observed in the simple castings systems used for these investigations provide a basis for understanding the relative feeding requirements of more complex castings.

In relation to other casting alloys, gray iron is unique in developing a natural excess of feed metal at a time that feed metal flow is required for the last regions of solidification at casting centers. For hypoeutectic irons, this feature results from the fact that two bands of freezing

(*Continued on page* 254)

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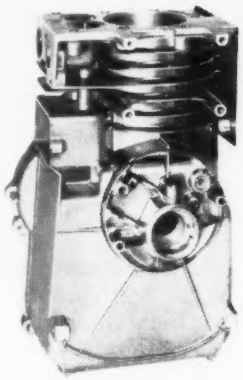

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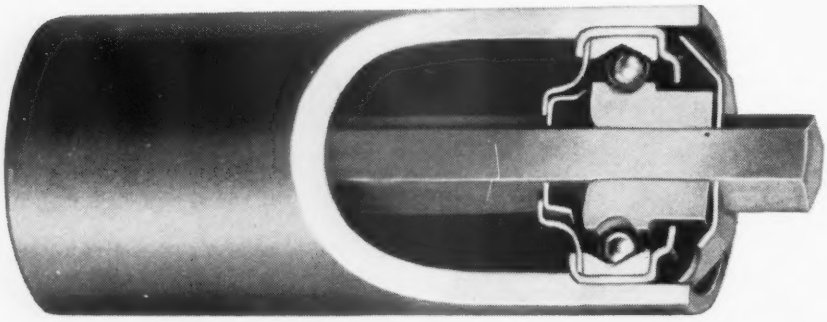

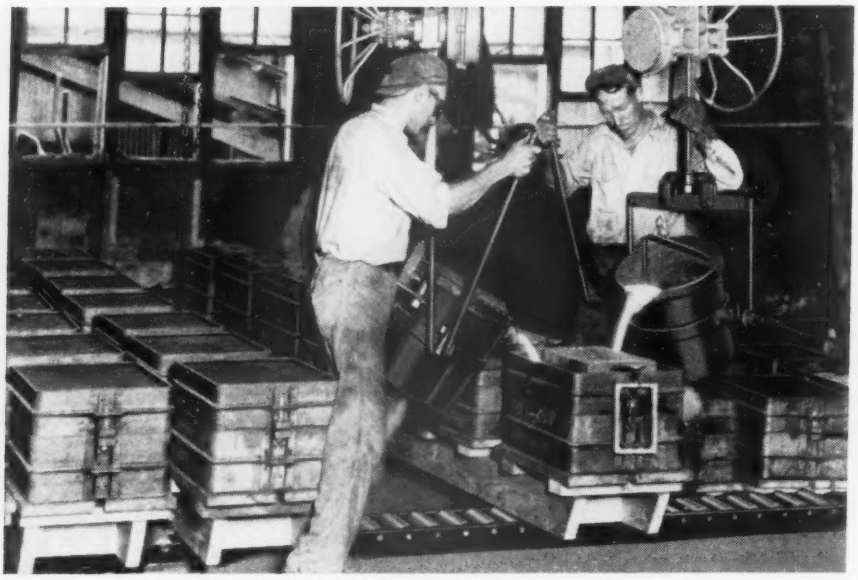

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(*Continued from page* 252)

traverse the casting during solidification. The first band results in the development of dendrite structures and requires compensation for liquid-to-solid shrinkage. During this cycle the irons behave like any other metal: If risers are inadequate, shrinkage voids are formed.

The second band which involves eutectic reaction cannot proceed through the casting until the movement of the dendrite band is completed because this is prerequisite to the formation of liquid of eutectic composition. When the eutectic reaction band sweeps through the casting, surplus liquid is created because of the formation of the low-density graphite phase. The surplus liquid is directed to any shrinkage void regions which may have been formed during the movement of the first solidification band, and any remaining amount is expelled (purged) from the casting if an opening is available. If not, the casting undergoes an expansion which results in the familiar "over-pattern" size features of gray iron castings. Thus, gray iron castings are "self feeding" for many varieties of shapes.

Self-Feeding Is Limited

For example, rangy castings may be made sound with small bobs; castings of moderately chunky shapes such as the 4 x 4 bars used in these studies require only small risers compared to those which would be required for steel. Obviously, the self-feeding, reverse flow of eutectic liquid is limited in amount. If a chunky shape is excessively underrisered, the resulting shrinkage void cannot be fully compensated. The absence of centerline shrinkage in hypoeutectic gray irons is another feature which may be ascribed to the self-feeding process.

Hypoeutectic nodular irons behave exactly like flake irons during the formation of the dendrite structures. Until the remaining liquid is concentrated to eutectic composition because of dendrite formation, requirements of feed metal flow from risers will be the same, as will shrinkage formation if insufficient feed metal flow is provided. However, a basic difference develops during the movement of the eutectic freezing band, in that graphite expansion cannot serve to cause reverse flow of feed metal.

The graphite expansion serves only to cause plastic deformation of the casting walls. Thus, there is no self feeding action, and shrinkage regions formed during the first cycle of solidification remain intact. Centerline shrinkage develops as in the

(*Continued on page* 256)

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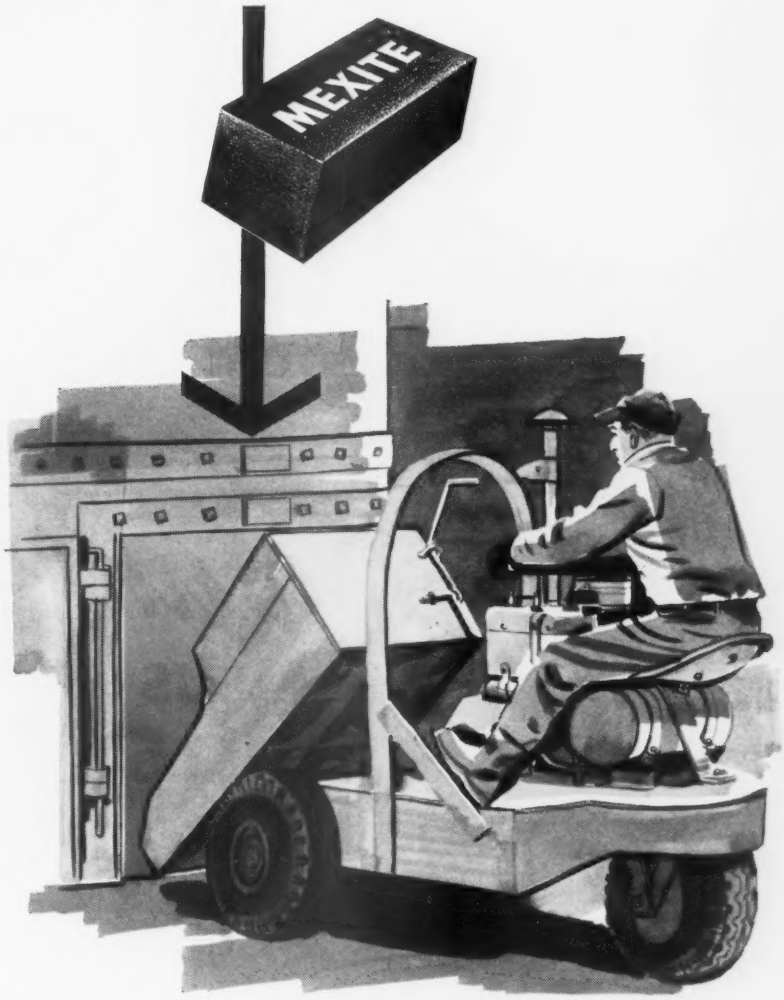

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MEXITE helps produce better castings because they permit accurate carbon control. MEXITE helps assure lower chill and hardness, and provides better fluidity and machinability thus increasing useable metal yield and cutting scrap loss. MEXITE briquettes are packed 90 lbs. to a carton for easy handling and storing. We'd like to show you what MEXITE can do in your foundry . . . write us today for a specific recommendation made for your particular area. We'll also send along our newest bulletin that will show you how MEXITE can help keep your costs down where you want them to be.

** Based on average current pig iron and scrap prices*

OUR 100th YEAR

188

THE UNITED STATES GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION • SAGINAW, MICHIGAN

★ A typical illustration showing the application of Standard Radius Chills and patented Adjustable Radius Chills. Note how the Adjustable Radius Chills conform to the compound corner curves.

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Straight Section or Adjustable

Milwaukee straight section Radius Chills have been used to considerable advantage on straight fillets and edges in many leading steel foundries. The new patented Adjustable Radius Chills, with equally spaced slots so that sections may be cut off in one inch segments, fulfill the need where chills are necessary along the fillets of cylindrical, round, or irregularly shaped castings. These Adjustable Chills have effected substantial savings in welding and cleaning costs.

WRITE FOR SAMPLES AND PRICES

Milwaukee Chaplet & Mfg. Co.

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(*Continued from page* 254)

case of steels. From a viewpoint of riser dimensioning and positioning, it must be concluded that the requirements should approximate those of steel and thus are completely different from those of conventional gray irons.

In a consideration of complex castings, it should be recognized that the reverse feed metal flow process typical of gray iron applies to joined sections of different freezing rate (section size). In the same manner that excess feed metal is returned to the riser, thin sections should deliver their surplus eutectic liquid to heavier sections in co-operative fashion.

A comment should be made with respect to sand used in the mold since various investigators have demonstrated relationships of gray iron shrinkage and dilation to sand. The various sands used in these studies had no appreciable effect on solidification conditions; it is evident, however, that the seacoal sand permitted greater expansion in "capped" gray iron castings and in the various nodular iron castings.

Sand Has No Effect

With the "open" riser gray iron castings there was no significant difference due to sand. It is quite obvious that sand should affect shrinkage formation and risering requirements of castings if the mold is enlarged at positions of high hydrostatic pressures, with resultant swelling of mushy regions of casting. This effect in no way detracts from the analysis of this investigation in terms of metal factors, for the analysis is applicable irrespective of sand type.

It would be much clearer to place sand effects in the category of mold rigidity rather than in the undefined category of "sand." This should dispel the rather magical association of iron casting defects with sand. The sand wall can affect shrinkage in only one of two ways: 1. Change in solidification characteristics; this does not occur since the heat transfer rates of the various sands are quite similar. 2. Not remaining fixed; this is a question of rigidity and is a function not only of formulation, but also of ramming conditions.

Obviously item 2 is not easily defined by a simple quotation of the type of sand in relation to casting shrinkage features which are greatly dependent on casting geometry per se.

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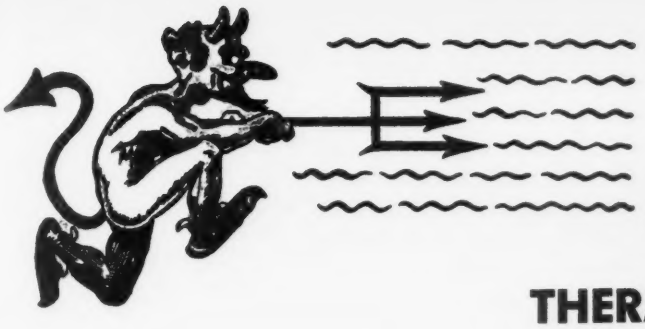
1. Boyles, A., "The Structure of Cast Iron," ASM, 1947.
2. Eash, J. T., "Effect of Ladle Inoculation

(*Concluded on page* 258)



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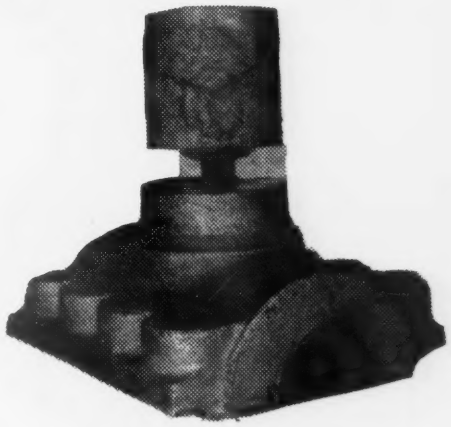
Keeps metal molten!

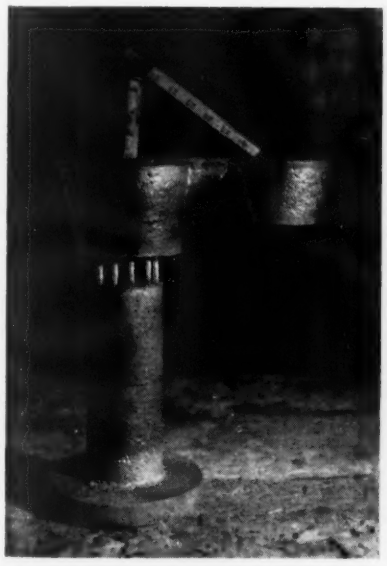
. . . for Steel, Iron, Aluminum, Brass, Bronze, Copper

THERMOTOMIC "X" is a patented exothermic compound that produces a temperature over 3500° F. It can be molded or baked into any desired shape the same as sand cores. THERMOTOMIC "X" is used as knock off core rings with 1½ inch feeder opening under risers of feeding heads, also as insulating sleeves, inserts and facings, or mixed with facing sand where it is desired to maintain fluidity of the casting metal. Shorter and more compact heads and risers can be used. The small feeder opening permits easy removal of feeding heads and risers. In conjunction with THERMOTOMIC COMPOUNDS, we recommend the use of exothermic CARBON FREE LIQUIDIZER NO. 5 on top of the metal in the heads or risers as an insulating cover. For green sand casting molds, use THERMOTOMIC WP (Waterproof).

U. S. Patents No. 2,490,327 and No. 2,500,097



300 lb. aluminum bronze bearing cap cast with THERMOTOMIC feeding ring core under riser. Note small feeder opening which facilitates removal of riser from casting, resulting in greatly reduced cleaning costs.



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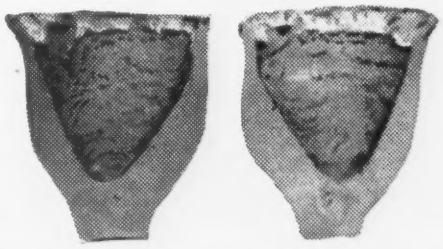
Made by direct pouring through the Thermotomic strainer core under the feeding head.

No chills were used, no shrinkage at the flange. Note depth of shrinkage in the feeding head.



NOTE THESE TYPICAL RESULTS FROM THE USE OF SOFFEL'S CARBON FREE LIQUIDIZER

With the application of 1 pound of SOFFEL'S CARBON FREE LIQUIDIZER, this 6″ x 6″ chrome-nickel-steel riser was reduced in weight from 32 pounds to 13 pounds average. A savings of 19 pounds of salable metal, normally discarded as scrap, was fed into the casting and produced a heavier, sounder casting. Note the feeding head can be knocked off easily, saving burning costs. There is no better feeding head compound at any price than SOFFEL'S CARBON FREE LIQUIDIZER.

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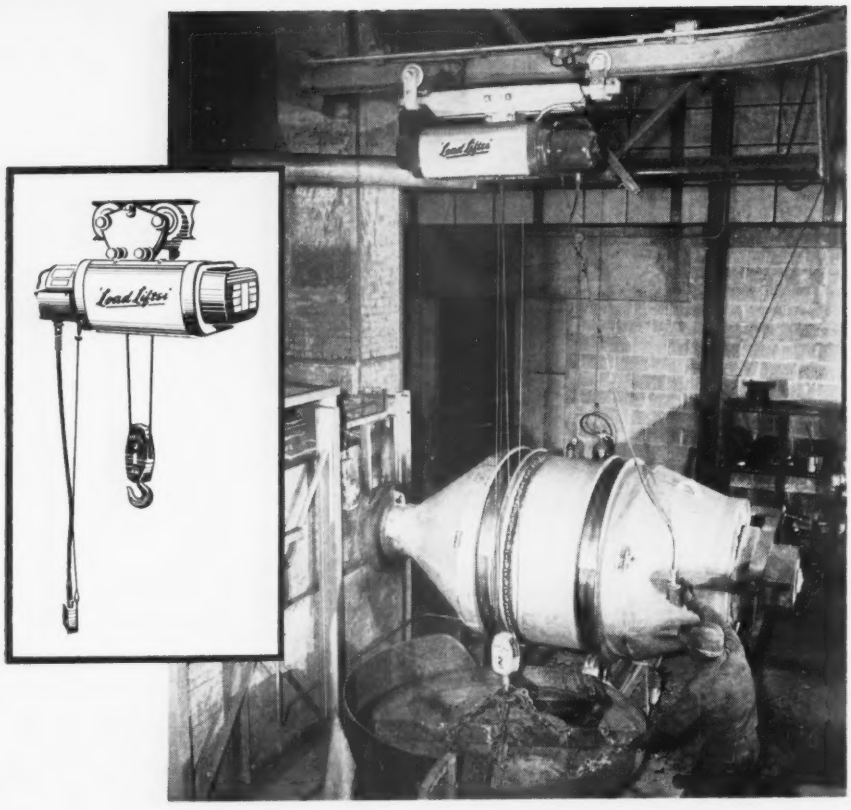

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The two-speed "Series 700" 'Load Lifter' Electric Hoist gives foundrymen the right speed at the right time — at the push of a button. There's a fast high that lifts a 1-ton load half a foot a second. There's a slow creeping speed for setting cores; drawing patterns; and closing flasks easily, smoothly, carefully.

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On every count, the two-speed 'Load Lifter' is the best electric hoist investment you can make. Capacities range from 1/2 ton up. Your local "Shaw-Box" Distributor will gladly give you all the facts — or write for Buletin 399.

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(*Concluded from page* 256)

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3. Dunphy, R. P. and Pellini, W. S., "Nodule Genesis and Growth in Magnesium Treated Hypoeutectic Irons," Congres International de Fonderie, Brussels, 1951, and FOUNDRY, January, 1952, p. 82.

4. Dunphy, R. P. and Pellini, W. S., "Solidification of Gray Iron in Sand Molds," *Transactions*, AFS, Vol. 59, p. 425 (1951).

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6. Dunphy, R. P. and Pellini, W. S., "A Solidification Dilatometer and its Application to Gray Iron," *Transactions*, AFS, Vol. 60 (1952).

7. Dunphy, R. P. and Pellini, W. S., unpublished data of the Naval Research Laboratory.

Cutting Refractory Costs

(*Continued from page* 107)

lowing problem was encountered. After a certain number of heats, the service lining, through fusion and erosion, became so thin that it no longer adhered to the backup lining and began to sag and/or pull away.

As the process progressed, cracks appeared, and previously eroded brick joints sprang apart, forming openings which allowed the flame to get behind the service lining. As a result of this action, the service lining was heated from both sides and became softer and sagged ever more until it finally collapsed and fell into the bath. Usually this action took place on the upper wall. It is not a desirable situation, but it does not prohibit finishing the heat in a normal manner. If the portion of the wall which collapses is large enough, however, there is danger of the bath's floating the lower portion of the wall directly under the collapsed area since there is nothing above to hold it in place.

The 4½-in. backup lining then is exposed to the flame action and usually is burned sufficiently to eliminate reuse of these bricks on the next furnace repair. Consequently, only 6 or 7 in. of brick are used serviceably since 2 or 3 in. are lost when the service wall collapses. An additional section is lost when the 4½-in. backup lining is used to finish the heat. This, of course, is an expensive procedure. With us, it led to the elimination of the 4½-in. backup lining above the slag line. This step precluded the separation of the two walls, but resulted in shorter side wall life since it was not feasible to support the bungs on only a few inches of brick as the wall became thinner. Further, in hot weather the amount of heat radiated through a side wall constructed in this manner made it difficult to work near the furnace.

After numerous tests on varying methods of construction, a brick was selected that would eliminate the ex-

(*Continued on page* 260)

Strong, sound irons for special castings are produced in this Lectromelt Furnace at Ferro Machine & Foundry Company, Cleveland.

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Lectromelt Furnaces range in capacities from 25 pounds to 150 tons, meeting every development and production requirement. They permit the most exact control of temperature and analysis. They're on melting, refining, smelting and reduction work. For Bulletin No. 9, telling you more about them, write Pittsburgh Lectromelt Furnace Corp., 314 32nd Street, Pittsburgh 30, Pa.

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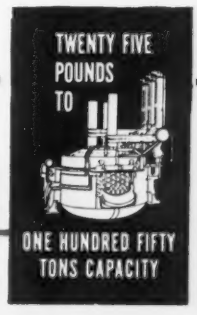
WHEN YOU MELT... *Lectromelt*



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★EASE OF MOLDING

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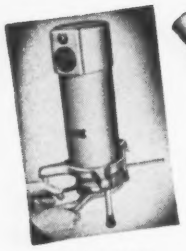
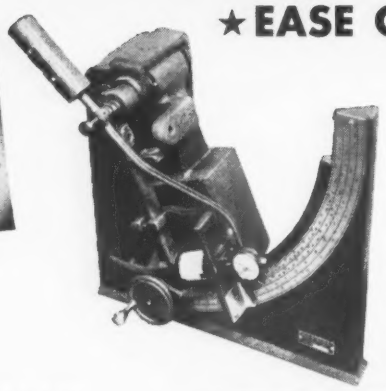


MOISTURE



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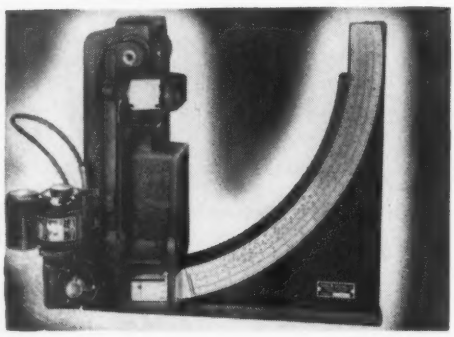
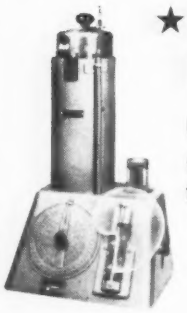


★CASTING FINISH

Improves with sand grain size and distribution control.

FINENESS



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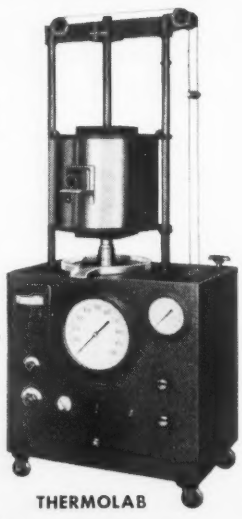
Improves with hot strength and hot deformation control, which insures freedom from mold wall and core failure at pouring temperatures.



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(Continued from page 258)

cessive number of joints and the 4½-in. backup lining, but still retain a full 13½-in. wall thickness above the slag line. With this type of construction it now is possible to burn back to within 3½ in. of the furnace plates before replacing the wall and still have sufficient footing at the top of the wall for the bungs to rest upon. One disadvantage has been that during the last two or three heats on these walls, a greater amount of heat than normal is radiated, making it uncomfortable to work next to the furnace for any length of time. This heat loss is not, however, sufficient to impair furnace operations.

Because of the advantages of this type of construction, furnace side walls now are built, above the slag line only, of a high heat duty, stiff mud brick of standard shape, 2½ x 6 x 13½ in. Although these bricks are more expensive than either the regular or large 9-in. straights, their use results in an over-all cost reduction.

Cost Comparison

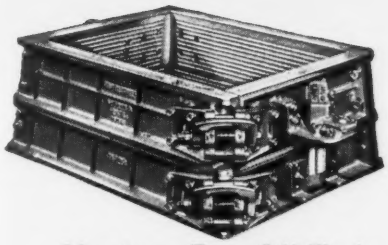
In order to compare costs, let us consider a furnace with side walls 30 ft long, 5 ft above the bottom at the burner end, tapering to 2½ ft above the bottom, directly in front of the rear bridge wall (see Fig. 1). Disregarding all openings in the walls, we have a total wall area of 225 sq ft.

Plan A (see Fig. 2) consists of constructing the furnace walls with regular 9-in. straights. Considering only the service lining, we find that a total of 2880 brick are needed. At the present base price of $109.00 per thousand, the cost of the refractory alone is $313.92. This lining was found to be good for only ten heats.

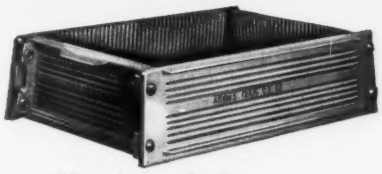
Plan B (see Fig. 3) consists of building the side walls with large 9-in. straights backed up with a 4½-in. lining of regular 9-in. straights. Again considering only the service lining, we arrive at a total of 1920 bricks needed. At the present cost of $196.20 per thousand, brick cost alone is $376.70. This lining also lasted ten heats under normal operating conditions.

Plan C (see Fig. 4) consists of constructing the side walls according to Plan B to just above the slag line and of completing it from there on up with 2½ x 6 x 13½-in. straights. Considering only the service lining below the slag line (area A, Fig. 1), we find that 512 large 9-in. straights are needed, at a cost of $100.45. For the balance of the wall, 1584 pieces of 2½ x 6 x 13-in. straights are needed. At the present price of $262.00 per thousand, these bricks

(Concluded on page 262)



• Aluminum Easy-Off Flask



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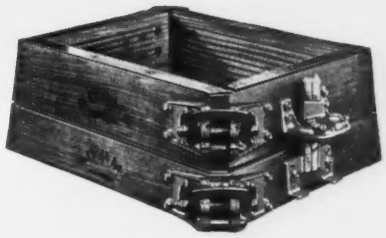
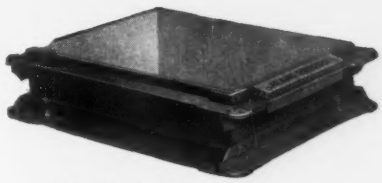
• Exceptional performance



• Cherry Easy-Off Flask



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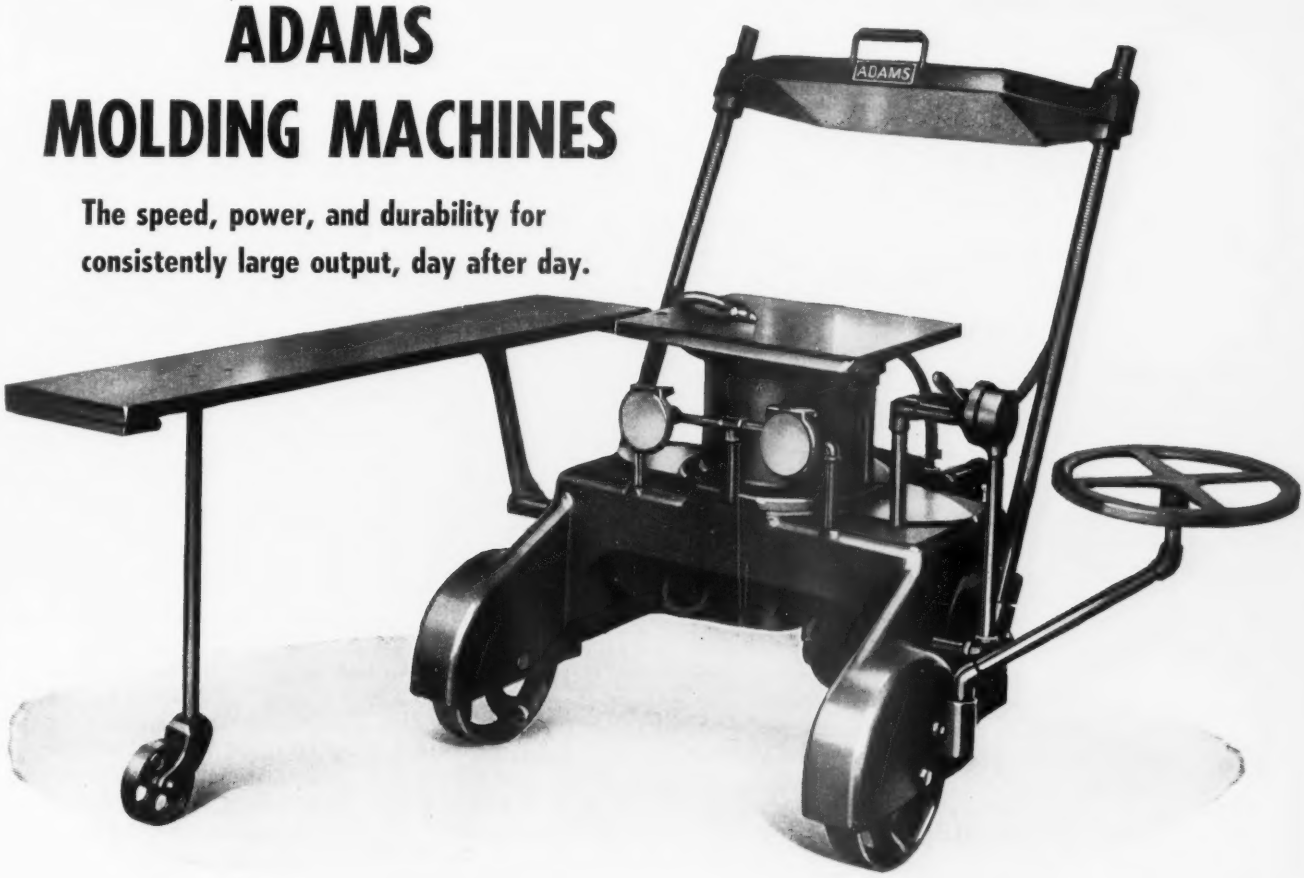

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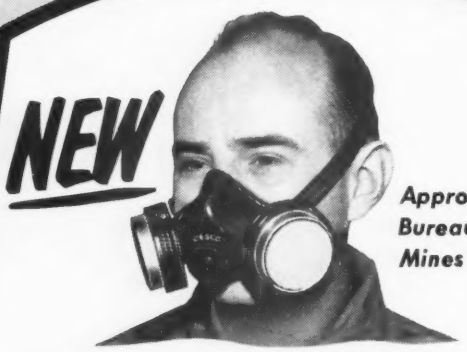

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• Positive acting inhale-exhale check valves prevent rebreathing or exhausting through cartridges. Valves are replaced without tools. Two 85cc absorbent cartridges provide ample breathing efficiency. They are easily and quickly replaced by unscrewing retaining caps.

• The CESCO No. 99 Respirator is covered by Bureau of Mines approval No. 2307 for organic vapors not exceeding 1/10 of 1% by volume.

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(*Concluded from page 260*)

cost $415.01. Total refractory cost for this type of construction is $515.46. This lining was good for 15 heats during normal operations.

Assuming that the labor involved for the three types of construction is the same, and that it takes 90 man-hours for each repair at an average cost of $2.25 per hour, the labor cost is $202.50 per repair.

Table I shows the cost comparison for all three plans.

As can be seen readily from this table, the greatest saving is in the labor cost. However, there is a saving of $3.31 per heat in refractory cost in Plan C over Plan B.

Plan C has an additional economic advantage in that 10 in. of brick can be used serviceably with no apparent danger of the wall's collapsing. Other savings which do not appear in the calculations include these: 1. No loss of backup lining brick in Plan C over both A and B; 2. No extra handling of backup brick lining such as salvaging and relaying in Plan C over both A and B; 3. One-third less consumption of large skews or special shapes upon which the bungs rest in Plan C over both A and B; and (4) since side wall life is extended 33⅓ per cent, refractory unloading, freight and palletizing costs for side wall brick are correspondingly less. This saving was estimated to run about $3 per heat.

When one stops to consider the cost of malleable air furnace refractories, together with all the attendant expenses, it becomes apparent that this is no small item in regard to raw material cost. A saving of $13 per heat, regardless of the tonnage melted, will range, during a normal year's operation, in the neighborhood of $3250. An added incentive to the head of the melting department is that less work actually is connected with this method of installing side walls, and because of the variables from shop to shop, it is felt that other savings might be realized in varying operations.

Equipment Rental Plan Being Offered

An equipment rental plan is being offered by the Induction Heating Corp., 181 Wythe Ave., Brooklyn 11, N. Y., manufacturer of dielectric core baking ovens. The plan gives the user the choice of subsequent outright purchase or of continuing on a regular rental basis.

Rental payments are graduated, decreasing annually. A brochure is obtainable on request, giving all details and cost schedules.

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All good casting starts in the melt with more accurate control of temperature and closer control of chemical composition. These are both *inherent advantages* of Ajax-Northrup High Frequency, Hi-Speed Induction Furnaces.

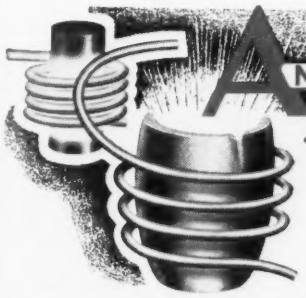
Accurate analysis is simply achieved and continuously maintained by fast melting . . . with practically no chance for oxidation. Alloying is easy because losses are negligible . . . you get out what you put in. And, even with elements of widely dissimilar densities, you pour metal of uniform composition since the melt is constantly, thoroughly stirred by electromagnetic action inherent to the furnace principle.

In actual production with an Ajax-Northrup Furnace, alloying elements can be controlled usually within 0.25%; carbon within 0.01 or 0.02%. Melts can be reproduced . . . each time with identical composition . . . or alloys may be varied quickly. Pouring temperature, especially important in centrifugal and precision casting, may be maintained exactly as desired.

Practical savings with Ajax-Northrup Hi-Speed Melting are found in the almost complete recovery of alloying elements. Savings are also realized in an overall reduction in rejects and subsequent grinding operations.

TECHNICAL DATA AVAILABLE: Tell us what you're melting . . . and in what quantities. We'll send you the proper bulletins.

543



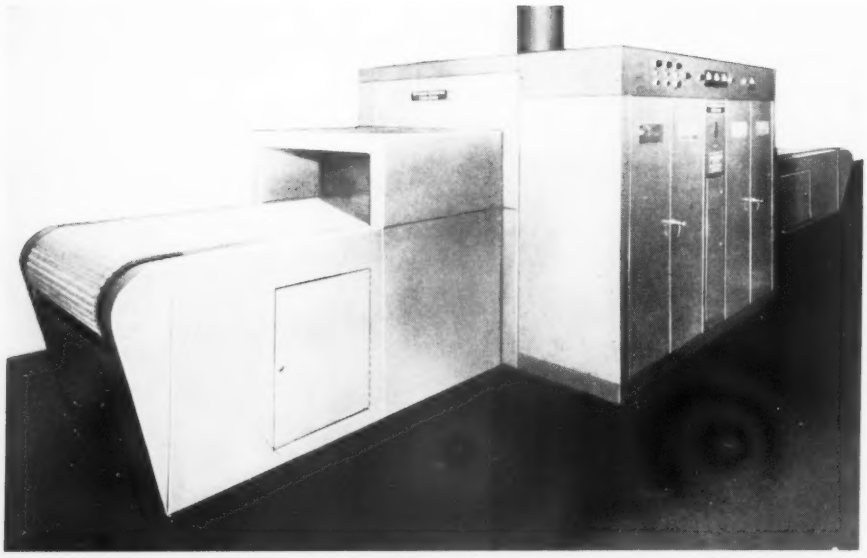
AJAX NORTHRUP *SINCE 1916*

INDUCTION HEATING-MELTING

AJAX ELECTROTHERMIC CORPORATION • AJAX PARK, TRENTON 5, NEW JERSEY

Associated Companies: Ajax Electrometallurgical Corp. • Ajax Electric Furnace Co. • Ajax Electric Company, Inc. • Ajax Engineering Corp.

NEW EQUIPMENT AND SUPPLIES



Dielectric Core Oven: Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13—Line of dielectric core ovens features an integral, unitized design in which the oven conveyor, high-frequency generator and control units combine to form a simple, rugged functional unit. Automatic "load monitor" and pushbutton spacing of the electrode free the operator from making frequent adjustments. Safeguards are incorporated to protect the operators and the equipment. Three basic models are available, with ratings of 15, 25 and 60 kw each.

For More Details Circle No. 1—Page 267

Release Agents: Dow Corning Corp., Midland, Mich.—Two silicone release agents of high-viscosity silicone fluids in mineral spirits are for use by shell molders who wish to use solvent-type agents rather than water emulsions. Designed for use on deep-draw, narrow-draft patterns, the agents assertedly leave minimum build-up, ease pattern cleaning and provide multiple releases. While one agent, containing 5 per cent solids, is designed for immediate use, the other, containing 50 per cent solids, is recommended for those who make up concentrations to meet special requirements. Dilutable in mineral spirits, it will not separate in storage after dilution.

For More Details Circle No. 2—Page 267

Wet Grinder: Standard Electrical Tool Co., 2507 River Rd., Cincinnati 4—Compact, single-wheel wet grinder features vibrationless operation. Two-speed multiple v-belt drive from 5-hp motor to grinding spindle is said to be versatile and efficient. A safety interlock prevents overspeeding of grinding wheel. Wheel changing is simplified by positive shaft lock. Wheel is protected by structural plate steel guard, adjustable for wheel wear, and steel wheel flanges. Splash pan supports 10 in. square work table grooved in top

for vernier gage use and reversible wear plates that are renewable. Table adjusts 15 degrees above and 30 degrees below horizontal. Grinder is available in 12, 14, 16, 18, 20, 24, and 30-in. wheel sizes.

For More Details Circle No. 3—Page 267

Vibrating Conveyor: Hewitt-Robins Inc., Stamford, Conn.—Small vibrating conveyor, mounted on springs, conveys at 38 fpm such diversified materials as metal scrap, coal, sand and gravel, flue dust, chemicals and wood chips. Pans with special coating or stainless steel are available to make conveyor suitable for handling corrosive and abrasive materials. Model can be set up or moved in less than an hour. Standard pans are 4 in. deep and can be supplied in widths of 8, 12, or 18 in. with or without top covers. Single-drive, 1-hp model is available in lengths from 20 to 100 ft, and transfer sections can be used to couple two or more units in tandem.

For More Details Circle No. 4—Page 267

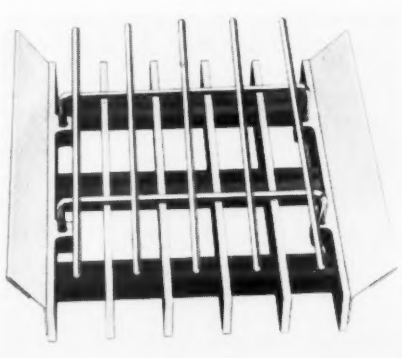
Metal Cleaner: Oakite Products Inc., 19 Rector St., New York 6—Alkaline type cleaner is designed to clean aluminum, steel and other metals in pressure-spray washing machines without objectionable foaming. Manufacturer reports the powder is completely soluble in water, is free rinsing, and inhibited to provide safety to aluminum. The cleaner is recommended for all pressure washing machine applications in the concentration of ½ to 2 oz per gal, at temperatures ranging from 160 to 185° F.

For More Details Circle No. 5—Page 267

Etcher: Crown Industrial Products Co., 916 Amsterdam St., Woodstock, Ill.—Etcher consisting of a power unit and separate tray attachment is suited for marking hardened and ground surfaces, aluminum and stainless steel as well as zinc, copper, steel and their alloys. Only switches are a starting switch and a rheostat switch to control the density of the etch. Provision is made for maximum power control to prevent burning out power unit. No acids are used and reportedly there is no danger of shock to the operator.

For More Details Circle No. 6—Page 267

Magnetic Separator: Homer Mfg. Co., Lima, O.—Magnetic grate, designed to be placed in hopper throats or floor openings, are said to trap the smallest and most elusive tramp iron particles. Grate consists of a wire grid with horizontal rods placed between highly saturated magnetized bars. The horizontal rods deflect free flowing material into

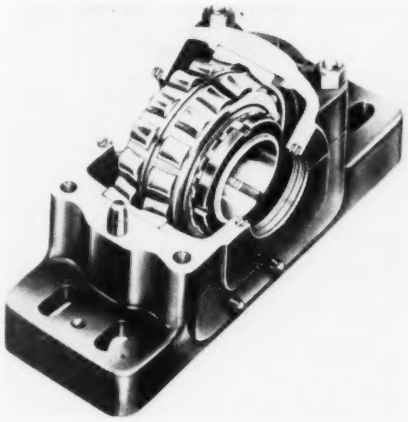


For More Details on these Items
Use Reply Card—Page 267

streams which wipe the magnetized bars. They are built in sizes from 2 x 4 in. up to 6 or 8 ft square. Larger special grates of any wanted size or shape can be furnished.

For More Details Circle No. 7—Page 267

Roller Bearings: Link-Belt Co., 307 North Michigan Ave., Chicago 1—Heavy-duty, self-aligning, roller



bearings designed for severe operating conditions are housed in a rugged steel pillow block. The split housing has heavy sections, rugged base and cap, and large studs, dowels and mating surfaces. Inspection of bearing is possible by removing housing cap. Bearings are made in shaft diameters from 2 7/16 to 6 15/16 in.

For More Details Circle No. 8—Page 267

Shell Mold Resins: Plastics Engineering Co., 1607 Geele Ave., Sheboygan, Wis.—Two-stage, finely pulverized phenolic resins for shell molding processes are available in various compositions and formulas to produce characteristics desired over a wide range of operating conditions. Mixtures are claimed to build a satisfactory shell in minimum dwell time and have little or no tendency to drop off or peel back from pattern plate. They are said to cure quickly, provide shell strength and rigidity, surface hardness and easy release from the pattern.

For More Details Circle No. 9—Page 267

Fluorescent Inspection: Magnaflux Corp., 7300 West Lawrence Ave., Chicago 31—New scale of sensitivity in penetrant inspection is claimed for a fluorescent penetrant inspection material that contains no emulsifier. Use of new penetrant is said to reveal both very tight cracks and broad, shallow defects generally missed in previous penetrant methods. As material contains no emulsifier, one is added to the part after penetration by a separate dip. In this way, both emulsification time and washing are controlled to suit the particular part or type of defect. Material contains a high concentration of bright fluorescent dies to aid inspection.

For More Details Circle No. 10—Page 267

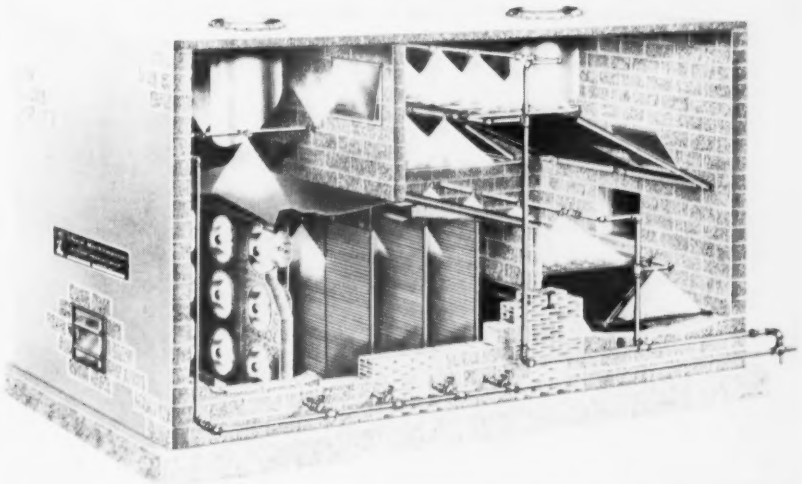
Carbide Hand File: Severance Tool Industries Inc., 753 Iowa St., Saginaw, Mich.—Lightweight carbide hand file for production filing, deburring and other applications can be reground many times. Carbide cutting surface is ¾ x 6 in. on all models and is available in coarse, medium and fine cuts with 16, 25, and 40 teeth per in., respectively. Other cuts and

variations are available for unusual filing applications. Handle and knob are included as pictured.

For More Details Circle No. 11—Page 267

Arc Furnace Control: Whiting Corp., Harvey, Ill.—New electric arc furnace control uses an air-counterbalance hydraulic drive energized directly from the furnace bus without special rotary generators. Continuous running, nonreversible motors eliminate the "stop, start and go"

Dust Removal System Put in Low Cost Housing



LIQUID precipitating gas scrubber for removal of large volumes of dust from stacks is made for installation in low cost housings of cinder block, concrete or fabricated steel. The housing can be built as a permanent installation or, if made from fabricated steel, as a portable unit. Both concrete and cinder block construction are reported to provide durability and long term trouble-free operation. Housings made from either material are said to be resistant to most corrosive gases. Special linings can be installed. All connections are made to existing ducts with no need for complicated piping. Neither cloth bags nor filters are used.

All dust removed from the air is reduced to watery sludge which can be discharged into a tank or pond for easy removal of the solids. Where water supply is a problem, a recirculating system can be used. Approximately 2½ gal of water per minute at 40 to 50 psi are required per 1000 cfm. Eight models are available that can handle high-temperature gases in capacities from 8000 to 60,000 cfm. If greater dust removal capacities are needed, additional scrubber stages can be added. Precipitator elements can be adapted to meet varying conditions, and spray capacities changed to meet specific requirements. Manufacturer is Johnson-March Corp., 1726 Chestnut St., Philadelphia.

For More Details Circle No. 12—Page 267

HARDY CONTROLLED FOUNDRY SANDS

Send us your sand specifications and we will send you samples to see, feel, and test. You'll discover that Hardy Sands can assure you uniformity and control of product characteristics.

The Hardy Sand Company uses every practical scientific means to supply you with a sand that will cut down casting defects and improve finish. We have Foundry Consultants available—*at no charge*—to help you with any molding or core problem.

The Hardy Sand Company produces Natural Bonded Sand, Washed Silica Sand, Bank Sands, and are distributors for Mold-Rite, Big-Horn Bentonite, and Refract-O-Mold Spray.

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CHICAGO—Goebig Mineral Supply Company
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Producing controlled foundry sands for almost fifty years.

HARDY SAND COMPANY

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action formerly responsible for motor burn-outs. According to the manufacturer, extended production runs for the control show: Reduced operating cost, action with a response time of less than three cycles (1/20 of a second), reduced maintenance, reduced line surges, and an improved, totally different arc requiring less reactance and producing a higher power factor.

For More Details Circle No. 13—Page 267

Back Stand Idler: Carborundum Co., Coated Products Division, Niagara Falls, N. Y.—Back stand idler attachment for all types of wall, bench and floor coated abrasive backstand

grinding and polishing operations is designed for heavy-duty production grinding as well as for light polishing jobs which call for frequent setup changes. The idler permits belts of the same length to be employed with contact wheels of various diameters. Belts ranging from ½ to 8 in. widths can be used. A linkage-type arrangement permits finger-tip manual adjustment of tension and tracking. Two models are available, one for floor stand operations and the other for floor, wall or bench installation.

For More Details Circle No. 14—Page 267

Welding Accessories: Air Reduction Sales Co., 60 East 42nd St., New York 17—Cutting, welding and heating ranges of the company's general purpose oxyacetylene torches have been extended by new cutting attachments and a jet-type mixer. Jet mixer assertedly handles all welding and heating tip sizes with complete flame stability and minimizes sputtering, popping and flashback. Rubber sealing rings provide a gas-tight seal with hand tightening. Medium duty cutting attachment cuts steel up to 6 in. thick and heavy-duty attachment cuts steel up

(*Continued on page* 269)

HERE ARE QUICK REVIEWS OF NEW LITERATURE—available to foundrymen as "idea" and reference information. Readers in the United States and Canada may obtain copies by using the attached cards. Readers in foreign countries should write direct to the manufacturer offering literature.

71. Ovens, Heaters, Spray Booths

Burdett Mfg. Co., 3433 W. Madison St., Chicago 24, Ill.—Ovens, heaters, air make-up units, spray booths and washers are items described and illustrated in 12-page brochure MARCS. Burdett units utilize infrared radiant heating units with rays originating from refractory bowl of the burner to heat products from within.

72. Sand Control System

Harry W. Dietert Co., 9330 Roselawn Ave., Detroit 4, Mich.—Dietert-Detroit automatic molding sand control system described in 4-page bulletin consists of mated foundry units that are located at the sand mixers. It insures accurately controlled sand for improved casting quality with minimum of personal attention.

73. Belt Conveyor Carriers

Stephens-Adamson Mfg. Co., Aurora, Ill.—Spun-end interchangeable rollers, all-steel construction and better three-shot lubrication are improvements made in 220 series Simplex belt conveyor carriers, according to 4-page bulletin 453. Literature describes 5 and 6-in. roller styles.

74. Aluminum Pressure Castings

Accurate Match Plate Co., 1847 W. Carroll Ave., Chicago 12, Ill.—16-page booklet on aluminum pressure cast products is offered to acquaint reader with variety of aluminum production pattern equipment being made by pressure casting into plaster molds. Items described and pictured include matchplates, cope and drag plates, pattern castings, single impression dump box, single gang split box, dryer patterns and two impression mated box.

75. Metal Melting Furnaces

Stroman Furnace & Engineering Co., 9900 Franklin Ave., Franklin Park, Ill.—Briefly described and illustrated in 20-page bulletin 800 is line of metal melting furnaces as well as furnace room accessories. Stationary and tilting crucible type units, iron pot and dip-out furnaces, units for melting aluminum and other white metals, skip hoists, smelters furnaces, core ovens, oil burners and blowers are among items covered.

76. Corebox Vents

Andrea Mfg. Co., 180 N. Wacker Drive, Chicago 6, Ill.—Corebox vents made in R and S types in sizes from ¼ to 1 in. are described in 4-page folder.

77. Polishing Machines

Buehler Ltd., 165 W. Wacker Dr., Chicago 1, Ill.—Metallurgical laboratory polishing machines are covered in 8-page illustrated catalog and price sheet. Pedestal and bench units include triple head types. Specifications and other data are provided on machines as well as on accessories and polishing powders.

78. Rocking Electric Furnaces

Kuhlman Electric Co., Detroit Electric Furnace Div., Bay City, Mich.—Rocking electric furnaces with pedestal-mounted electrodes and hydraulic power control are subject of illustrated 4-page bulletin 504. Complete line offers capacities from 10 to 4000 lb per charge. Ratings range up to 600 kw.

79. Heat-Resistant Belting

Imperial Belting Co., 1750-1800 S. Kilbourne Ave., Chicago 23, Ill. — Standard and insulated Sahara heat-resistant conveyor belting for handling hot materials is subject of illustrated data sheet. Standard type handles materials up to 300° F and insulated type, up to 450° F.

80. Core Oils

Pelron Corp., 7740 W. 47th St., Lyons, Ill. — Standard and special problem core oils are discussed in 4-page illustrated booklet along with binders and washes and other foundry materials. Use advantages are described.

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We regret that owing to postal and mechanical problems over which we have no control, we are able to process literature requests mailed in the *United States and Canada only* until further notice. We suggest that you write direct to the manufacturer for product information at the addresses given in advertisements and literature descriptions.

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81. Ovens, Spray Booths

Newcomb Industries, Ltd., 1200 London St. W., Windsor, Ontario—Design and operational information is provided in 4-page catalog CA-101-53 on industrial ovens, parts washers, spray booths and dust collectors.

82. Alloying Metals

Electro Metallurgical Co., 30 E. 42nd St., New York 17, N. Y.—"Hot-Metal Magic" is title of well-illustrated 36-page brochure dealing with ferroalloys and alloying metals. In addition to giving a wealth of background and general data on this phase of industry, booklet deals specifically with individual story of such alloying metals as chromium, manganese, silicon, vanadium, tungsten, zirconium, columbium, boron, calcium and titanium.

83. Material Handling Equipment

Palmer-Shile Co., 16000 Fullerton Ave., Detroit 27, Mich.—48-page illustrated catalog gives specifications and other information on materials handling equipment. Products include skid and tote boxes, trucks, platforms, specialized crane attachments, reel stands, work tables, storage bins and pallets. Heavy-duty stacking skid boxes fabricated from corrugated metal and having side drop doors for access to contents are featured.

84. Air Cylinder Applications

Bellows Co., 222 W. Market St., Akron 9, O.—Air cylinder applications, including drilling, parts feeding and indexing, clamping, staking and other similar functions are covered in folding wall-chart type mailing piece. Features of the Bellows air cylinder with built-in valves and operating controls are also given.

85. Shell Molding

Plastics Engineering Co., 1607 Geele Ave., Sheboygan, Wis.—Plenco resins for the shell molding process are covered in 20-page well-illustrated booklet. Also given are other details on important parts of this process. "How-to" type instructions are supplemented with data on sources for equipment needed.

86. Rotary Tools

Elgin National Watch Co., Abrasives Div., Elgin, Ill.—"Golden Circle Rotary Tools" is title of 12-page illustrated bulletin covering burs, files, cutters, end mills, countersinks, etc. Both high-speed steel and carbide cutters are included in line. Size range available is shown in bulletin, which also includes a chart giving speed ranges for cutting various metals and similar data useful in selection and operation of this type tool.

87. Sand Rammer Butts

Arrow Butt Co., Box 2225, Brooklyn Station, Cleveland 9, O.—All-neoprene sand rammer butts are illustrated in 4-page folder. Bench and floor rammer, topping off, core, bench rammer pein and backfill tamper butts are covered as well as open hearth butts and arrow hand rammers. Sizes are given.

88. Segment Grinders

Cleveland Quarries Co., Sterling Grinding Wheel Div., Tiffin, O.—Advantages of Sterling No. 2 chuck and segments for surface grinding jobs are pointed up in 4-page piece. Chucks are supplied in diameters to take segment rings of 8 to 30 in. and in heights to handle work of any size.

89. Vibrating Conveyors

Jeffrey Mfg. Co., Columbus 16, O.—Well illustrated 24-page catalog 859 descriptive of MV mechanical vibrating conveyors gives consideration to operation, types, drives, advantages and characteristics. Typical installations are shown. In foundries, conveyors handle shakeout sand from continuous mold conveyor systems as well as hot castings.

IMPORTANT READING FOR FOUNDRYMEN

We have a limited quantity of the following reprints which we can furnish while they last.

90. Magnesium Sand Foundry

Highly diversified types of castings are produced in the magnesium sand foundry of Hills-McCanna Co., Chicago. Its operation, some of its techniques and plant organization are outlined in this reprint of a recent FOUNDRY article, written by Robert H. Herrmann, associate editor.

91. Foundry Conveyor Belting

"How to Specify, Install and Care for Conveyor Belting in the Foundry" is a special reprint of two FOUNDRY articles which should be of prime interest to all foundry engineering departments. The articles consider high temperature requirements, drive factors, sizes and capacities, speeds, splicing, repairing and other factors.

92. Cupola Coke Behavior

Tests intended to evaluate the behavior of coke in the cupola, particularly with regard to its carburization power or the facility with which the carbon passes into solution in molten iron are explained in this FOUNDRY reprint. Author C. R. Austin of Meehanite Metal Corp. makes use of charts, tables and photomicrographs.

93. Modernized Production

"Modernization Without Mechanization" is a reprinted FOUNDRY article which relates how this company makes malleable and gray iron castings. Only limited mechanization is employed in the operations described, yet the facilities are completely modern. Table of labor distribution is included.

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(*Continued from page* 266)

to 8 in. thick. A diaphragm-type valve for control of cutting oxygen is said to prevent gas leakage and eliminate the need for valve packing.

For More Details Circle No. 15—Page 267

Power Hopper: Kwik-Mix Co., 3026 West Concordia Ave., Milwaukee 16—Redesigned, heavier, and more powerful than earlier models, motorized hopper features 50 per cent increase in hopper capacity, four wheel balance and a seat for driver. New model is available as a hopper or flatbed platform. Hopper capacity is 2000 lb with 15 cu ft space for the

load. As a flatbed platform truck, it has a load area of 34 x 54 in. and is equipped with stake pockets and a latch for quick dumping. Forward and reverse speeds are as high as 6 mph. Transmission is direct through shaft and universal joints. Rear wheels track in line with drive wheels. Steering is of worm and gear type. Turning radius is 73 in. Standard tires for both steering and drive axles are 16-in., six-ply pneumatics. Weight of unit with hopper is 1100 lb.

For More Details Circle No. 16—Page 267

Fuel Additive: Towmotor Corp., 1226 East 126 St., Cleveland 10—Company claims that use of their fuel additive will result in increased power, improved performance and greater savings for lift truck owners. Tests conducted by this company have indicated that stop-and-go driving, combined with high compression engines and modern fuels, are the cause of gum carbon and varnish which lower engine efficiency. It is said that use of this fuel additive removes the carbon and varnish and coats the engine with a fine protective film to which carbon and varnish cannot adhere.

For More Details Circle No. 17—Page 267

Fire Hose: Hamilton Rubber Mfg. Corp., Mead & Lever Sts., Trenton 3, N. J.—Fire hose employs a chemically produced polyester fiber as filler cord reinforcement. These filler cords are stated to offer a lighter, more

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...to better your GRINDING operation. Investigate *Electro* "SPECIFIC PURPOSE" resin or vitrified GRINDING WHEELS

By means of a job-side survey at your plant Electro can determine what is a better wheel for the specific job at hand.

Such job-side surveys are made by Electro in order to sell wheels that will serve the customer better.

A job-side survey will be made at your plant without cost or obligation on written, telephoned or telegraphed request from you.

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flexible hose with less bulk, easier to rack and handle in action. It can be supplied in 1½ and 2½-in. ID, double jacket construction, with test pressure of 400 psi.

For More Details Circle No. 18—Page 267

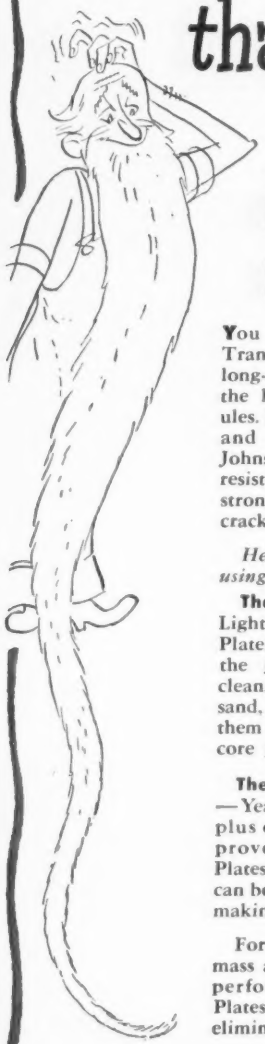
Gage Block Set: George Scherr Co., 200 Lafayette St., New York 12—Nine piece set of gage blocks, offering 331 different combinations in 1/64-in. and 1/100 in. is said to aid micrometer accuracy. By setting a micrometer to the nearest combination, lead errors of the micrometer screw are rendered harmless, reports the manufacturer, because the gage blocks are measuring standards accurate to within five millionths of an inch. Reliable measurements in 0.0001-in. can be obtained in conjunction with micrometers, dial indicators and other instruments.

For More Details Circle No. 19—Page 267

Welding Helmet: General Electric Co., Schenectady 5, N. Y.—Seamless, lightweight, plastic welding helmet incorporates ventilation features for cooler welding and prevention of lens fogging. According to company engineers, the plastic shell is heat-resistant, moisture-proof, and non-warping. It is designed to fit any head contour, and size adjustment is provided by a ratchet-type device, and a four-position stop meets vertical and overhead needs. The helmet is available in a black finish with or without a flip front. Respective weights of the two styles are 29 and 25 oz.

For More Details Circle No. 20—Page 267

Looking for core plates that LAST LONGER?



. . . then use TRANSITE CORE PLATES that stay on the job year in, year out

You can rely on durable Transite* Core Plates to give long-term service, even under the heaviest foundry schedules. Made of fibrous asbestos and cement, by a special Johns-Manville process, they resist shock and corrosion, are strong and durable, will not crack or break easily.

Here are more reasons for using Transite Core Plates:

They speed production—Light-weight Transite Core Plates are easier to handle on the job. They're easier to clean, too . . . core wash, sand, etc., do not adhere to them as readily as to other core plate materials.

They maintain accuracy—Years of foundry service, plus exhaustive tests, have proven that Transite Core Plates do not warp readily . . . can be used for precision core making indefinitely.

For core plates of large mass and small surface area, perforated Transite Core Plates are also available to eliminate green cores and reduce baking time. For full details, write Johns-Manville, Box 60, New York 16, N. Y.

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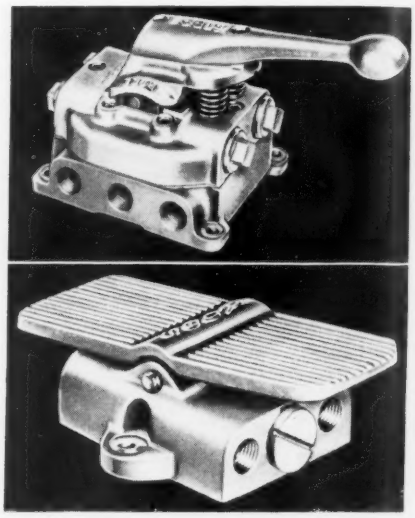
Johns-Manville TRANSITE CORE PLATES

Made of Asbestos

Control Valves: Ross Operating Valve Co., 134 East Golden Gate Ave., Detroit 3—Variety of air control valves have been added to company's



line. Design changes are said to reflect improvements in the operating mechanisms. Interchangeable hand levers and foot treadles permit simple conversion from hand to foot operation. Valve bodies can be removed for maintenance without disturbing the piping. An optional base is provided which allows for manifolding a series of valves and are available in three-way and four-way models with pipe sizes of ¼ and ⅜-in.

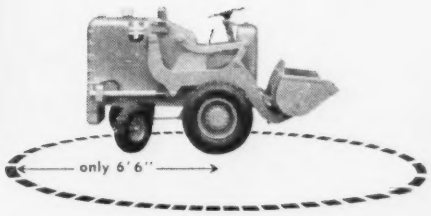
For More Details Circle No. 21—Page 267

Sandslinger Liners: Latrobe Steel Co., Steel Products Division, Latrobe, Pa.—Sandslinger liners to fit 16, 19 and 22-in.-diam sandslingers are manufactured from steel developed specifically for applications involving extremes in abrasive wear. Liners are preground to eliminate decarburization and heat treated and die quenched to insure proper radii and shape.

For More Details Circle No. 22—Page 267

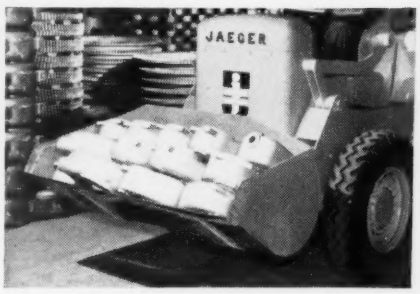
Automatic Pyrometers: Assembly Products Inc., Box 191, Chagrin Falls, O.—Ten additional ranges, expanding total ranges to cover from —400° to 3000° F, have been added to the company's line of controlling pyrometers. The new series of instru-

(*Continued on page* 272)

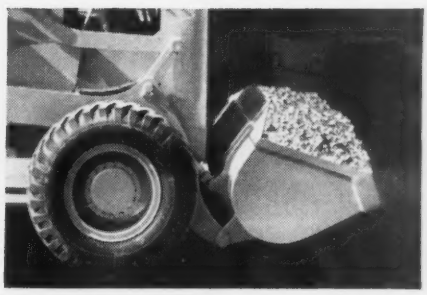


5" shorter turning radius (only 6'6") and faster speeds up to 13.88 mph in reverse, 7.66 forward.

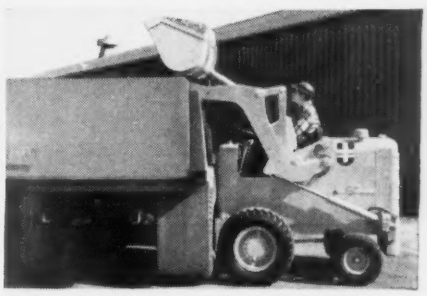
MOVE HEAVIER LOADS . . . TRAVEL FASTER . . . TURN SHORTER, QUICKER . . . DUMP HIGHER AND FARTHER*



20% more lifting capacity (1200 lbs.).



Low level bucket tilt-back permits full bucket loading, better carrying.



Higher dumping clearance of 4'6" under lip; 6'8" under hinge. Longer reach of 2'7".

Latest Jaeger 12 cu. ft. Auto-Scoop speeds one-man handling of bulk material

To help you cut the cost of bulk material handling, here's a scoop loader that's been developed *specifically* for most efficient operation. The Jaeger Auto-Scoop brings you greater power, speed and maneuverability to get more work done.

Bigger lifting capacity helps you handle heavier loads. Shortest turning radius speeds work in narrow aisles, box cars, cramped quarters. Highest dumping clearance and longer reach give greater range of load placement. Faster speeds, both forward and reverse, cut maneuvering and travel time. Independent forward-reverse control permits instant changes in direction, quick get-away.

Boom arms crowd the bucket forward as it rises — provide fast digging, full bites. Front driving wheels are at the fulcrum of the load . . . heavy loads help move themselves by increasing tractive power. Power tilt-back enables operator to crowd into material and flip bucket back before hoisting, insures a full load, and makes possible lower bucket level position for better carrying. Simplicity and ease of control, and effortless hydraulic functioning, encourage faster operation.

For complete facts, send for Catalog L12-4 and name of distributor who sells and services the Jaeger Auto-Scoop in your city.

For bigger work, 1 cu. yd. model, with torque converter and power steering, handles loads to 5,000 lbs. 2-wheel or 4-wheel drive.

* Based on comparisons with well-known scoop loaders now in the field.

The Jaeger Machine Company, 502 Dublin Avenue, Columbus 16, Ohio

JAEGER LOAD-PLUS auto-scoop

AIR COMPRESSORS • PUMPS • MIXERS • PAVING MACHINES

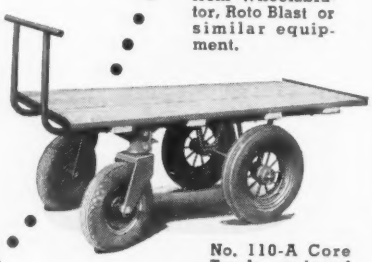
Distributors throughout U.S. and Canada and Principal Cities of the World

TRUCKS for Foundries!

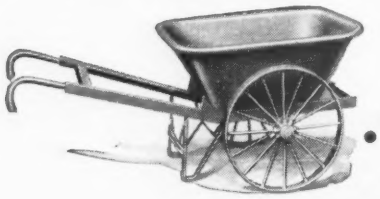
Sterling Heavy Duty Trucks are tailor-made for transporting castings, cores and heavy foundry equipment. Ruggedly constructed for heavy duty service and thoroughly job-tested under actual foundry conditions, Sterling Trucks have proven their ability to handle loads as heavy as 3 tons. Both wheels and casters are equipped with anti-friction bearings. Short turning radius. Easy maneuverability. Write for bulletins.

STERLING WHEELBARROW CO.
MILWAUKEE 14, WIS., U. S. A.

No. 160 Truck to receive castings from Wheelabrator, Roto Blast or similar equipment.



No. 110-A Core Truck equipped with pneumatic-tired wheels and ball bearing swivel casters.



No. 50 Slag Buggy especially designed for conveying slag. Heavy duty, reversible tray. Loose plate for discharge.

Sterling
FOUNDRY EQUIPMENT

A 5633-⅛R

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The sign, S-G, on aluminum ingot means aluminum of uniform quality made to meet the most rigid chemical and physical specifications. Whether it's for permanent mold, sand or die cast you can be sure with S-G ingot.

Our complete modern research and testing laboratories are available to help you secure just the right ingot to meet your needs.

BRASS AND BRONZE INGOT ALSO PRODUCED TO YOUR SPECIFICATIONS

SONKEN-GALAMBA Corporation
MEMBER ALUMINUM RESEARCH INSTITUTE
Riverview at 2nd Street • Kansas City 18, Kansas

(*Continued from page* 270)

ments are interchangeable with an older series. The pyrometers are "on and off" controls for furnaces, ovens and other equipment where temperature must be held by turning heat off and on. They are thermocouple millivoltmeters with adjustable contacts and load relay rated 5 amp, 125 v ac noninductive. Higher load ratings can be furnished.

For More Details Circle No. 23—Page 267

Belt Grinder: Hammond Machinery Builders Inc., 1600 Douglas Ave., Kalamazoo, Mich.—Flexible 1-in. abrasive belt grinder-polisher has

been added to the company's line of abrasive belt machines. Machine can be used for deburring, grinding and polishing and its 10½-in. throat depth permits finishing of hard-to-get-at areas, eliminating hand-filing on many jobs. Work table and belt platen permit grinding of flat surfaces. Irregular contours can be ground on a free belt by removing platen and work table. Available in either bench or floor model with built-in dust collector.

For More Details Circle No. 24—Page 267

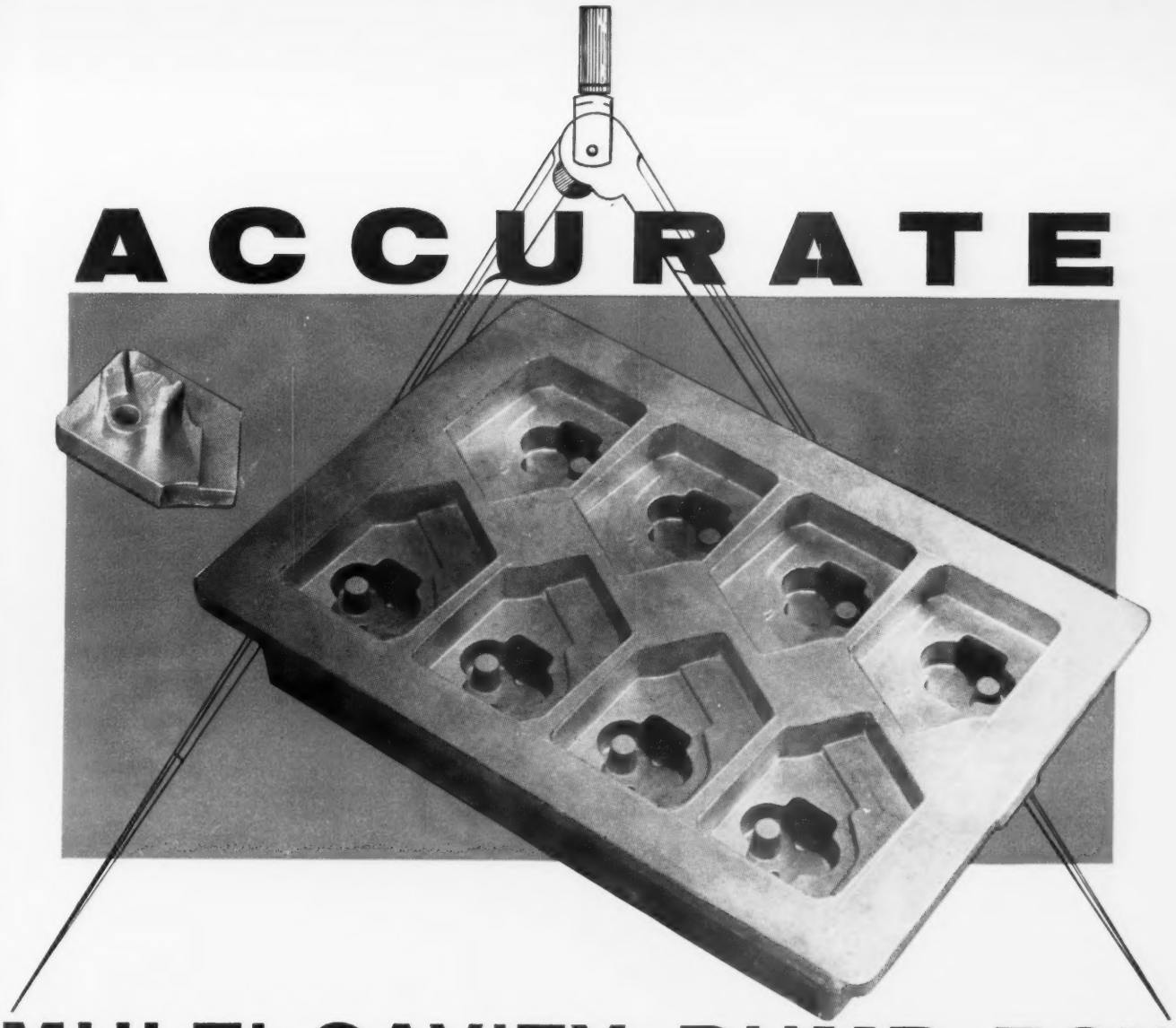
Pallet Truck: Paliton Inc., 40 West 29th St., New York 1—Pallet truck, designed to perform with ease for both light and heavy loads, has a 5-in. lift and a hydraulic pump that lowers at a controlled speed. Trucks are available in 2600 and 4000 lb capacities with fork widths of 20½ and 27 in. Fork lengths vary for specific jobs. Each width is offered in five varying lengths: under 36 in., 36, 42, 48, and 48 to 60 in. Twenty models are manufactured. Front wheels and fork wheels are carried on two ball bearings for complete maneuverability. Overloading is prevented by a relief valve.

For More Details Circle No. 25—Page 267

Masonry Cutting Blade: M. E. McGrath Co., Box 29, Webster Groves 19, Mo.—Series of break-resistant safety masonry cutting blades are manufactured in three specifications

(*Continued on page* 274)

ACCURATE



MULTI-CAVITY DUMP BOX

UNIFORM IMPRESSIONS... LOWER COST

The 8 gang dump box shown in this unretouched photograph was made from the single wood master core plug and backing frame. The same method may be used for two part split or booked type core boxes with flat or irregular partings. Added savings plus greater accuracy are assured when properly cleared white metal or aluminum master dryer patterns are also made by this same process.

There is real profit in this idea for you. Hundreds of foundries are now using this modern streamlined method of making core boxes and master dryer patterns because it is accurate, saves machining and offers large savings in the more intricate and gang type core boxes.

QUICK DELIVERY

By Air Freight, Parcel Post, Special Delivery or Railway Express. Pick-up and delivery by jobber representatives in the following areas . . .

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Harry H. Brown
Telephone: Midwest 4-8300
(Res. Birmingham, Mich.)

LOS ANGELES, CALIF.
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Write for Catalog

ACCURATE MATCH PLATE COMPANY
1849 WEST CARROLL AVENUE • Telephone: SEeley 3-7918 • CHICAGO 12, ILLINOIS

(*Continued from page* 272)
designed to cut the complete range of masonry materials from insulating firebrick to ceramic and salt glazed tile. According to the manufacturer, this is the first time a complete range of break-resistant safety blades has been offered to masonry cutting users.

For More Details circle No. 26—Page 267

Dual-Fuel Burner: North American Mfg. Co., 4455 East 71st St., Cleveland 5— Dual fuel burner is used on furnaces which require a high degree of temperature uniformity throughout or are operated at widely differing temperatures. Burner operates on gas or light oil and in either case up to 400 per cent of excess air may be put through the burner to achieve a high effective turndown, or increase temperature uniformity. The ability of these burners to operate with or without excess air permits operating a furnace at high temperatures for heat treating (1900° F) as well as at much lower temperatures for drawing and drying operations (600 to 900° F). Three sizes are available with air capacities ranging from 3880 to 9820 cu ft per hr for 16 osi air pressure at the burner.

For More Details Circle No. 27—Page 267

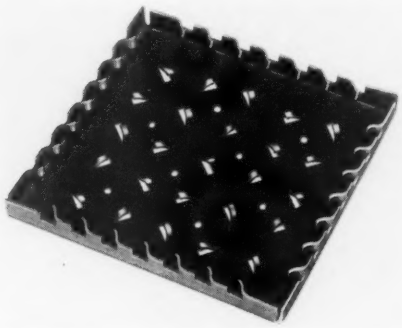
Quick Seal Plugs: Mechanical Products Corp., 168 North Ogden Ave., Chicago 7—Test plugs and filling connectors employing a cam-lever action are intended to save time and labor in pressure testing of castings, tanks, boilers, barrels, drums, radiators, assemblies, systems or virtually any pressure vessel. Openings may be closed quickly by inserting unit into the opening and depressing cam handle. Plugs and connectors are made for standard pipe openings from ¼ to 4 in. Seals on all units are adjustable for amount of expansion and holding tension, to compensate for wear and permit the maximum pressure resistance for the type of finish in opening to be sealed.

EXPANDING-SEAL TEST PLUG

EXPANDING-SEAL FILLING CONNECTOR

For More Details Circle No. 28—Page 267

Steel Floors: Flash Stone Co., 3723 Pulaski Ave., Philadelphia 40—Heavy gage rolled steel plates are



designed to provide a hard abrasion-resistant floor surface which will not buckle, curl, or crack and which does not accentuate noise. Each plate, embedded in concrete, is held in place with 25 surface anchors in each square foot and 28 edge anchors to prevent vertical or horizontal movement. It is claimed the steel-clad floor can be installed over sound wood floors, new or old concrete, or in place of worn brick or wood blocks, faulty metal plates or sheets.

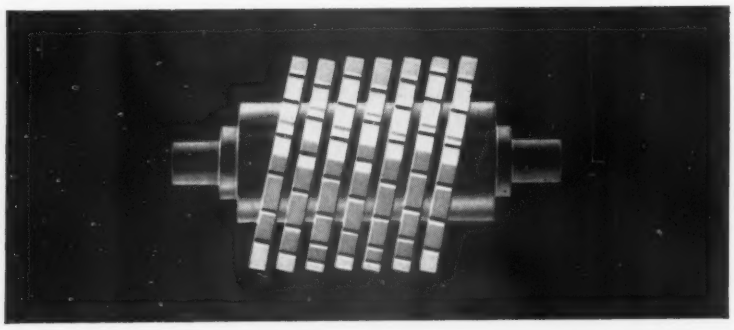
For More Details Circle No. 29—Page 267

Faceguards: Mine Safety Appliances Co., 201 North Braddock Ave., Pittsburgh 8—Comfort and strength are features of a smoothly molded headgear cap of glass fiber-reinforced

(*Continued on page* 276)

new ANGLE

for heavy-duty dressing



Desmond's Heavy Duty Dresser makes quick work of truing large, high speed rubber- or resinoid-bonded grinding wheels. Shears and picks at same time with patented angle-set Desmond-Huntington cutters. Dust-shielded ball bearings guarantee lasting precision. Cutters easily replaceable without adjusting bearings. Ask your Desmond distributor how proper dressing can make your grinding wheels serve better—longer.

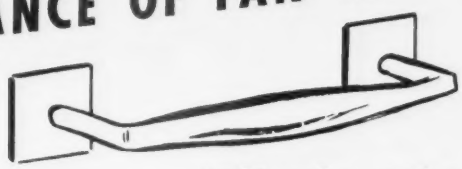
THE ONLY COMPLETE LINE OF GRINDING WHEEL DRESSERS AND CUTTERS

Desmond

THE DESMOND-STEPHAN MFG. CO., URBANA, OHIO

In The "Buffalo" Fan Balancing Room

THE IMPORTANCE OF MAINTAINING BALANCE OF FAN WHEEL

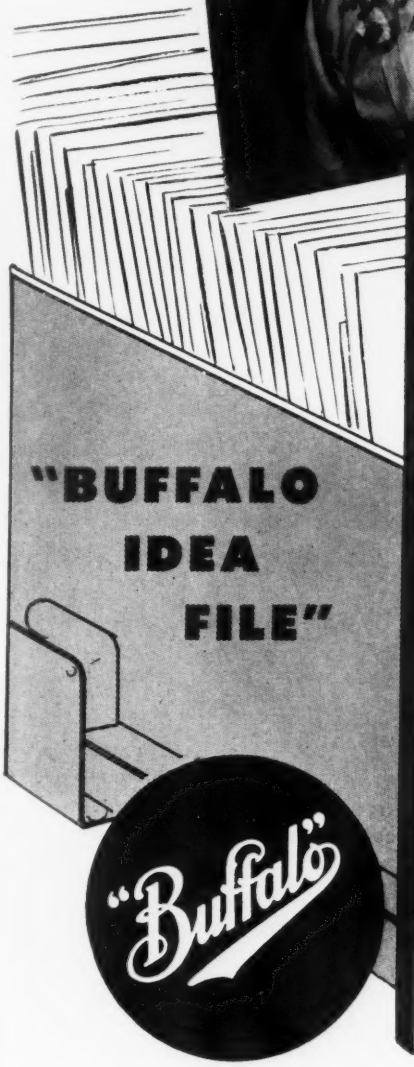


PROBLEM:
excessive vibration in exhaust fan delivering dust-laden air to cyclone. Fan operated smoothly a number of years, but gradually developed vibration and finally damaged the bearings.

SOLUTION:
Fan Wheel found to be far out of balance due to uneven buildup of slightly moist dust particles on blades. Fan rotor had never been cleaned, and had condition been permitted to continue, further bearing troubles and a sprung shaft might have resulted. "Buffalo" representative advised owner to clean rotor every six months, then check wheel balance. Fan has since operated smoothly, with no further bearing trouble, and at greatly reduced noise level. NOTE: all "Buffalo" fan rotors are balanced both statically and dynamically on precision balancing machines at the factory. Regular periodic cleaning and repainting followed by a balance check will assure added years of smooth, efficient performance.

This is one of the thousands of problem-solution case histories accumulated in "Buffalo" files during our 77 years of building air handling equipment and solving air problems for industry. Call your nearest Buffalo Engineering Sales Representative — get the benefit of his factory trained "know-how" and experience to help you solve your air problems.

Write for Maintenance Data Booklet 3426



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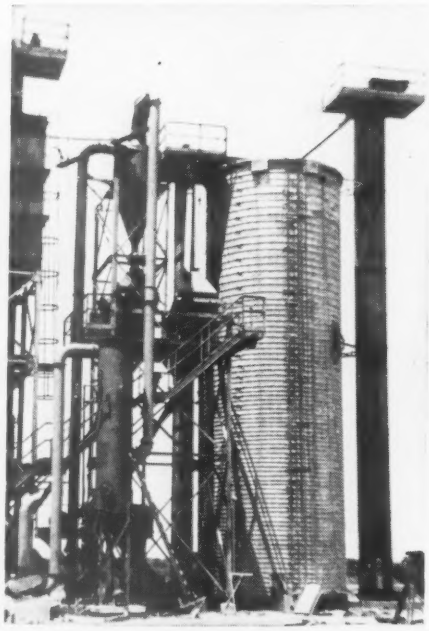
HEAVY stuff in N. & F. Silo becomes LIGHT

Raw, crushed perlite is moved through the 16 x 50 foot silo which we erected at the Linden, N. J., plant of the Great Lakes Carbon Co. Perlite is heavy. It weighs 90 lbs./cu. ft. After being sintered, the perlite becomes light-weight aggregate.

You are probably concerned with the handling of other kinds of flowable bulk materials—cement, clay, coal, grain, limestone, ore, sand, wood chips—or any other of the more than 80 varieties for which Neff & Fry Silos are used.

If so, obtain the facts about our silos. We'll be glad to send you interesting literature and answer your questions.



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NEFF & FRY ➧ SUPER-CONCRETE STAVE STORAGE BINS

Control Foundry Chilling with

CHILL KOOLHEAD NAILS

CHILL NAILS and SPIDERS

Choose any style chill nail from jumbo to stubby; slim, medium, or horse nail blade; blunt, pointed, straight or 90° bent. Same types available in Stainless, Brass, Aluminum; Copper coated to order. Spider Chills, jumbo or horse nail legs—double or single. Available in various sizes and types; also made to your individual specifications.

Write for detailed descriptions and prices.

STANDARD HORSE NAIL CORP.
Since 1872 NEW BRIGHTON, PA.

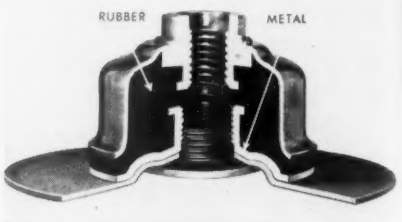
Other Products
PINS STEEL Stanho PRODUCTS KEYS
SPECIAL PARTS

(*Continued from page* 274)

cellulose construction, bonded with weather resistant resin. Visors are 12 in. wide for protection against side impact or splashes. Sweatband is of soft, absorbent foam rubber. Rubber gasket seals space between visor and cap when visor is pulled down. Friction joint stops and holds visor at any angle over a 200-degree arc.

For More Details Circle No. 30—Page 267

Vibration Dampeners: J & H Products Co., 3007 Elm St., Dallas 1, Tex.—Vibration dampener is used



with air or electric right angle head grinders with raised hub disc wheels, abrasive discs and cup wheels. These advantages are claimed: Breaks solid connection between grinder and wheel or disc, reduces operator fatigue by taking torque out of the grinder, prolongs life of grinder by its cushioning action, reduces grinder noise, produces an oscillating action which retards loading and heating, and lap grinds the work which eliminates concentric grinding rings, scoring and grooving.

For More Details Circle No. 31—Page 267

Emergency Lighting: Nickel Cadmium Battery Corp., Easthampton, Mass.—Instantaneous and automatic

6-volt light can be supplied by nickel-cadmium steel-encased alkaline storage battery in event of power failure. This nickel-cadmium battery, claimed to be the first made in America, has characteristics of long life and freedom from need of care. Two 6-volt lamp heads and reflectors are mounted on top of the unit. Front panel includes a high-rate charge timer that can be set from 0 to 12 hr, an amber neon "readiness" light, a red neon

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NAME: _____ *TITLE:* _____

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Does your company operate a foundry? ☐ Yes. ☐ No.

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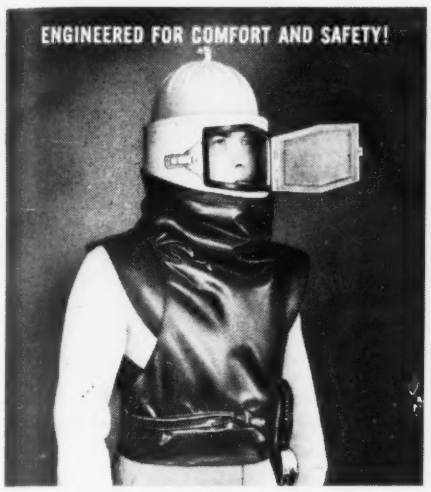
McDonald AIR-SUPPLIED HOODS

APPROVED BY THE
U. S. BUREAU OF MINES



McDonald **SAND BLAST HOOD** *(shown above)*
Heavy cape, double-coated with plastic, takes maximum punishment. Muslin inner collar gives additional protection against dust seepage. A hinged screen cover protects hood window.

Both Hoods feature:

- ✓ EXTRA LARGE WINDOWS (Easily replaced)
- ✓ SAFETY LATCH
- ✓ RIBBED HEADPIECE
- ✓ SUSPENDED HAMMOCK HEADGEAR
- ✓ NO-FOG AIR FLOW
- ✓ POSITIVE AIR FLOW (with new McDonald Air-Flow Control Valve)

McDonald **BLASTFOE ABRASIVE HOOD** One-piece cloth cape, impregnated with Neoprene to cushion impact of flying particles and rebounding shot, covers the entire unit. Other features are identical with Sand Blast Hood.

WRITE FOR BULLETIN AND PRICES

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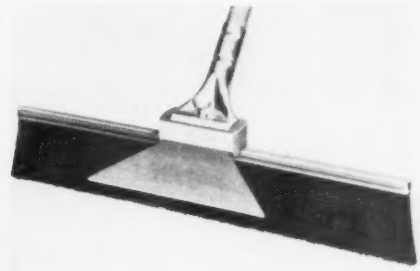
Manufacturers & Distributors of Industrial Safety Clothing & Equipment

Safety FROM HEAD TO FOOT

5721 West 96th St., Los Angeles 45
Other Offices in San Francisco and Houston

high rate light, light switch and push-button test switch. Removable sub-assembly carries all other components. Circuit is designed to maintain the battery on a trickle charge and to permit recharging within 12 hours.
For More Details Circle No. 32—Page 267

Push Broom: Fuller Brush Co., Industrial Division, Hartford 2, Conn. —Lightweight push broom has been

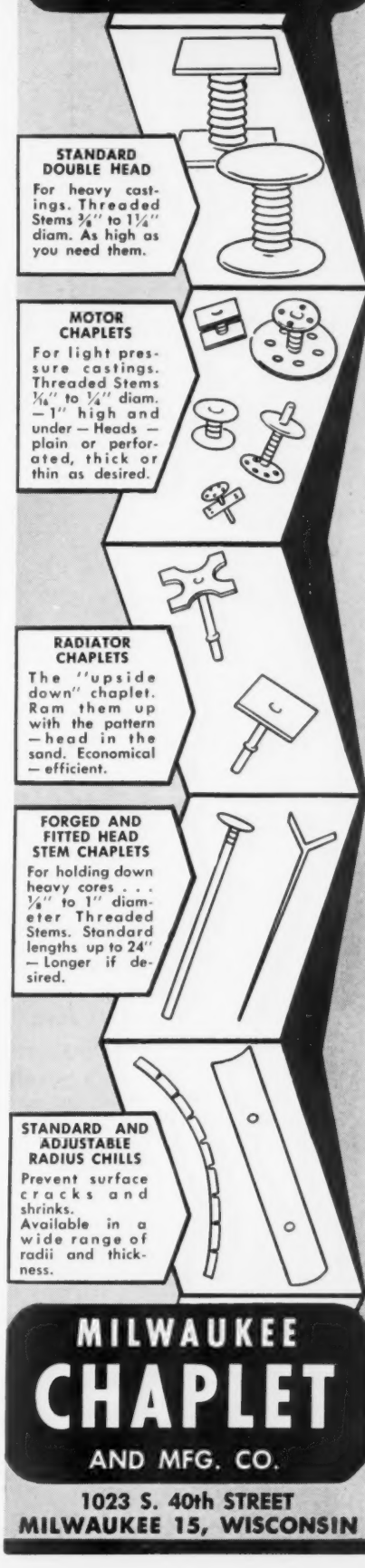


made of heat and acid resistant materials for use in glass plants, metal-working shops, foundries and other industrial plants. Brooms are reported to last five times as long as ordinary brooms. When worn, only the brush strip is replaced. An optional metal scraper will fit on the head clamp at right angles to the brush strip for removal of well-packed deposits such as mud and grease. A multiposition head clamp also is available to set the brush strip in any of four different positions. Standard widths are from 18 to 36 in. but special lengths can be furnished.
For More Details Circle No. 33—Page 267

Towing Tractor: Clark Equipment Co., Industrial Truck Division, Battle Creek, Mich. — Manufacturer

has redesigned line of general utility towing tractors to provide greater driving safety, comfort and simplicity. Basic dimensions of the 500-lb drawbar pull tractor have been retained but the driver platform has been lengthened and brake pedal relocated to provide more driver room without affecting turning radius and the intersecting aisle dimensions. Control lever has been altered to reduce hand fatigue, and center control linkage has been moved to a lower cross bar so that the handle is obstruction free. Exhaust pipe has been relocated to reduce fumes reaching the operator.

MILWAUKEE CHAPLET



STANDARD DOUBLE HEAD
For heavy castings. Threaded Stems ¾" to 1¼" diam. As high as you need them.

MOTOR CHAPLETS
For light pressure castings. Threaded Stems ⅛" to ¼" diam. — 1" high and under — Heads — plain or perforated, thick or thin as desired.

RADIATOR CHAPLETS
The "upside down" chaplet. Ram them up with the pattern — head in the sand. Economical — efficient.

FORGED AND FITTED HEAD STEM CHAPLETS
For holding down heavy cores . . . ⅛" to 1" diameter Threaded Stems. Standard lengths up to 24" — Longer if desired.

STANDARD AND ADJUSTABLE RADIUS CHILLS
Prevent surface cracks and shrinks. Available in a wide range of radii and thickness.

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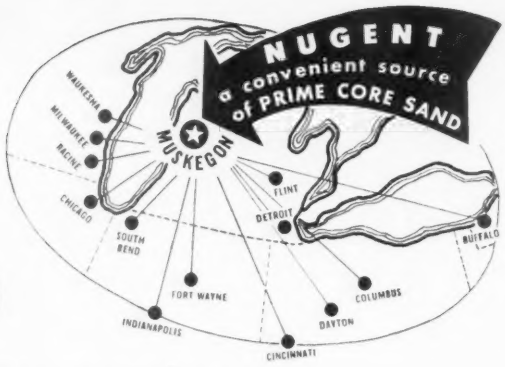
CHAPLET
AND MFG. CO.
1023 S. 40th STREET
MILWAUKEE 15, WISCONSIN

FIVE GRADES of CORE SAND



tested before you use them!

Exclusive with Nugent — 5 grades of dune sand processed from the best Muskegon Dune Sand — dried — graded to a constant AFS grain analysis of 39, 43, 48, 52 and 55 maintained through daily testing. Gives more uniform cores — consistently uniform molds — complete shipping and bulk storage facilities — prompt shipments of sand by rail or truck when you need it — based on over 40 years of "know how" supplying prime core sand.

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Columbus 15, Ohio

CARPENTER BROTHERS, INC.
Milwaukee 3, Wisconsin

GREAT LAKES FOUNDRY SAND CO.
Detroit 26, Michigan

1912 **CANNON** core sand 1954

THE NUGENT SAND COMPANY, INC. MUSKEGON, MICHIGAN

"FALLS BRAND" ALLOYS

AMERICA'S LARGEST PRODUCERS OF ALLOYS

"FALLS" MANGANESE COPPER

Use: To introduce manganese into brass, bronze, nickel and nickel silver alloys.

Form: Shot or bars (in any reasonable weight), in three grades according to application.

Applications: Grade I . . . adding manganese to or deoxidizing copper base alloys where low impurities are specified.

Grade II . . . as oxidizing agent in production of nickel and nickel silver alloys intended for rolled products. Has decided whitening effect.

Grade III . . . for manganese bronzes.

CCS

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NIAGARA FALLS

Smelting & Refining Division

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Engine has been equipped with revised piston rings and aluminum pistons.

For More Details Circle No. 34—Page 267

Line Marker: M-B Corp., New Holstein, Wis.—Hand-propelled, pressure-type line marker has 10-gal

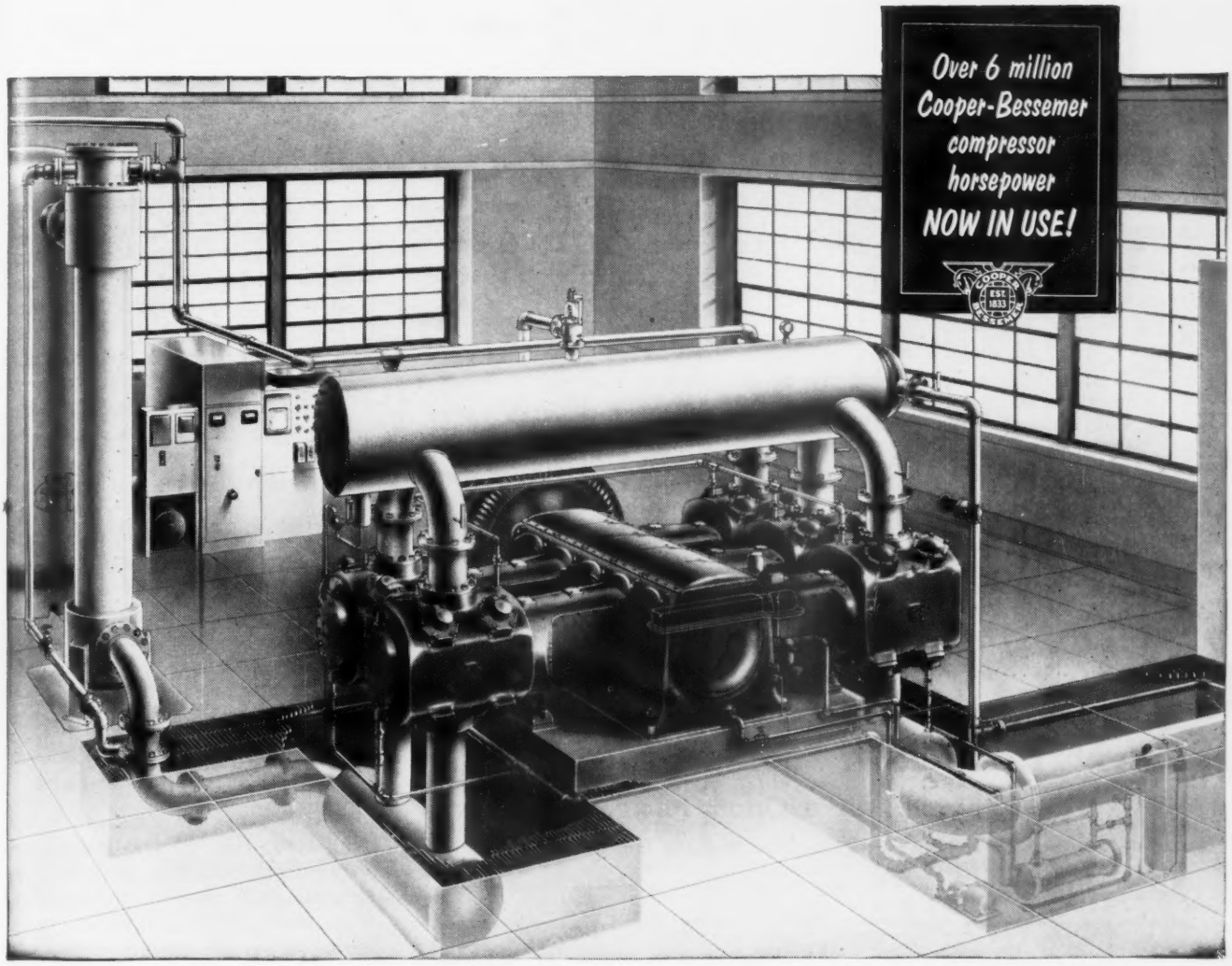
paint tank and marks single lines 2½ to 5 in. wide and up to 8000 ft per hr of 4-in. line. Air-cooled engine reportedly uses only 1 gal of gasoline per day. Thorough atomization distributes paint evenly and thriftily. Spray assembly is at right front for maneuverability. Marker can also be used as a portable maintenance paint spray unit or as a production spray unit.

For More Details Circle No. 35—Page 267

Floor Sweeper: Parker Sweeper Co., 100 Bechtle Ave., Springfield, O. —Powered floor sweeper, utilizing

the turbine principle, is said to suck dust from the air at a rate of more than 300 cfm, while heavy-duty fiber brushes are whisking debris into a collecting hopper. Hopper can be emptied in about 10 seconds. The dust-collecting bag is large enough (1.6 cu ft) to permit infrequent emptying. All controls are within reach of the operator and there are no foot pedals and kick levers. Sweeper is self-propelled and powered by a 2-hp gasoline engine. Sweeping width is 28 in. and permits cleaning of more than 30,000 sq ft of floor space per hour under normal conditions. Also available in 40 in. width.

For More Details Circle No. 36—Page 267



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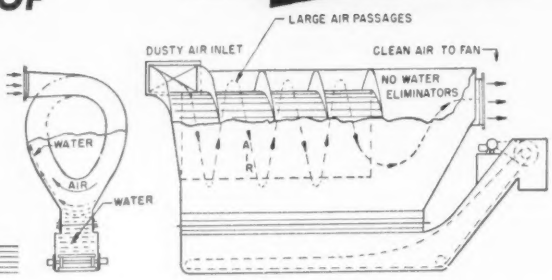

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for Better Melting

pH Value of Sand

(Continued from page 119)

Unitcast of pH control with soda ash, the commercial grade of sodium carbonate, we have seen all stages of the above situation occur in numerous foundries. In all cases where trouble occurred for no reason detectable by the usual laboratory methods, the use of soda ash immediately, in the first muller load, stopped the trouble.

In several foundries where there was no apparent difficulty, the use of soda ash gave an obvious increase in casting quality and ease of molding.

Fig. 4 is for a sand that was under pH control for several weeks prior to these tests. This sand, originally at a pH of under 6.0 due to a car of low (5.25) pH bentonite, was brittle in molding, eroded badly and gave numerous drag scabs. See Fig. 6. Additions of soda ash completely eliminated this difficulty and a temporary standard of 7.8 to 8.3 was set.

Very High Additions Harmful

Lowering the pH with acetic acid duplicated the original conditions. Two large additions of soda ash showed that very high additions were detrimental to surface finish. However, measurements showed a decrease in casting dimensions from 6-3/32 x 6 inches at a pH of 5.5 to 6 x 5-29/32 inches at the pH of 9.9.

Laboratory data on these black facing sands are given in Table I for those who may be interested. The authors wish to warn against drawing conclusions from a single test, but the parallel between hot strength and casting finish is of interest. The drop in hot strength at 1000°F for all the sand mixes is in line with previous experience.

Fig. 7 represents a series of castings made in a 3 per cent bentonite, 0.75 per cent cereal mix. No additions were made to the first mix, soda ash was added to the next two, and a commercial sand conditioner was added to the last.

A highly flowable sand was attained in mix number three, and for this low-strength mix such an advantage stands out.

Having shown that the pH value of molding sand may make a difference in castings, we must answer several pertinent questions. Do all western bentonites have the same pH? They do not; perfect control is not possible with this natural

(Continued on page 282)

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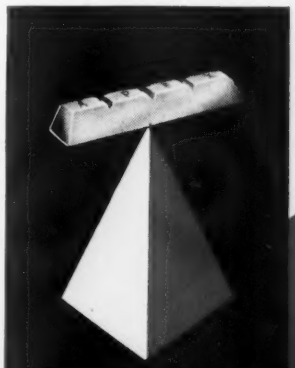

Research leadership back of every ingot

APEX SMELTING COMPANY

CHICAGO CLEVELAND LOS ANGELES

(*Continued from page* 280)

product. Variations may be minimized, however, by a check of, say, 2½ per cent of the bags in an incoming car. The possibility of a method for judging the value of bentonite is being investigated, and preliminary results are promising.

What besides bentonite affects the pH value? Some change is to be expected from chemicals in the water, and these vary from place to place. Cereal and wood flour are acid. These and other organic materials ferment in the sand to form more acids. Mold gases bubbled through a weak slurry of bentonite show that these gases also lower the pH value.

What is the best pH value for a sand mix? If you do not know, then no one knows for sure. For the present each sand must be treated as an individual case.

The question as to how one initiates pH control naturally arises at this point and will be answered in detail.

A Practical Approach—Each day's experience brings greater assurance that a sound general theory governing chemical additions will be found. Basic theory influenced our choice of sodium carbonate as the chemical to add. Practical considerations such as safety in handling, as well as price, were compatible with theory.

Through application in a number of foundries, we have learned that the practice is applicable to all molding sands, regardless of the metal poured. The data presented are limited to steel foundry sands and to a method that any foundryman may employ. In fact, he is a past master with this method: "Cut and try."

Various means are available for measuring pH values, ranging from the farmer's colorometric kit to extensive installations. Figs. 8 and 9 show two models of pH meters used by us. The industrial model is simple to operate and accurate beyond the needs of sand control. For rapid response (and ease of cleaning when clogged with clay), the glass sleeve type electrode is preferable.

Standards Are Essential

A water solution of the material is necessary. Because pH varies with concentration, some standard is essential. For the sands mentioned in this paper, equal weights of sand and distilled water gave a solution relatively insensitive to small variations in concentration. Bentonite slurries were tested at 10 per cent weight concentrations of bentonite. Paper cups are suitable as containers in routine work.

The simplest way to find the best pH range for your present sand mix is to make castings at several values. A pattern most susceptible to sand defects should be chosen. An approximation of the amount of soda ash to add may be made by constructing a pH versus per cent soda ash curve (Fig. 5). There may not be exact agreement between the laboratory curve and full muller loads, but the difference should be negligible.

Soda ash may be added to the muller as the dry powder early in the cycle, with lumps removed by screening before use. A solution may be used if desired.

No attention should be given the "feel" of the sand; it will feel different. Watch the molding and the castings. If a change in the pH value is indicated, initial additions may be made according to the results of the experiment. From that point the returning sand should be closely checked. When the pH of

(*Concluded on page* 284)

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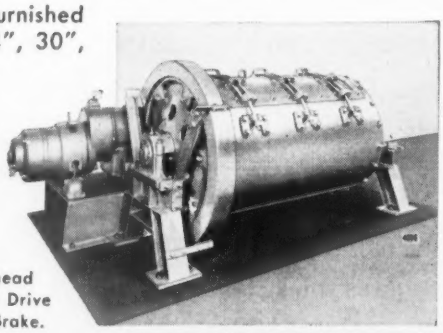
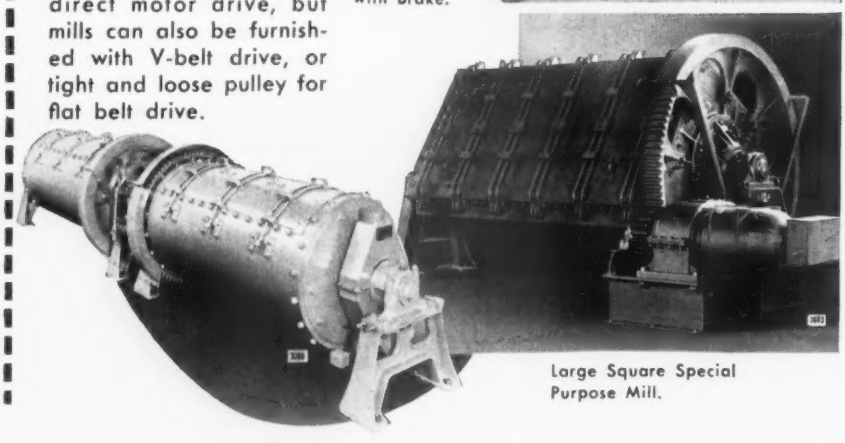


Gearhead Motor Drive with Brake.



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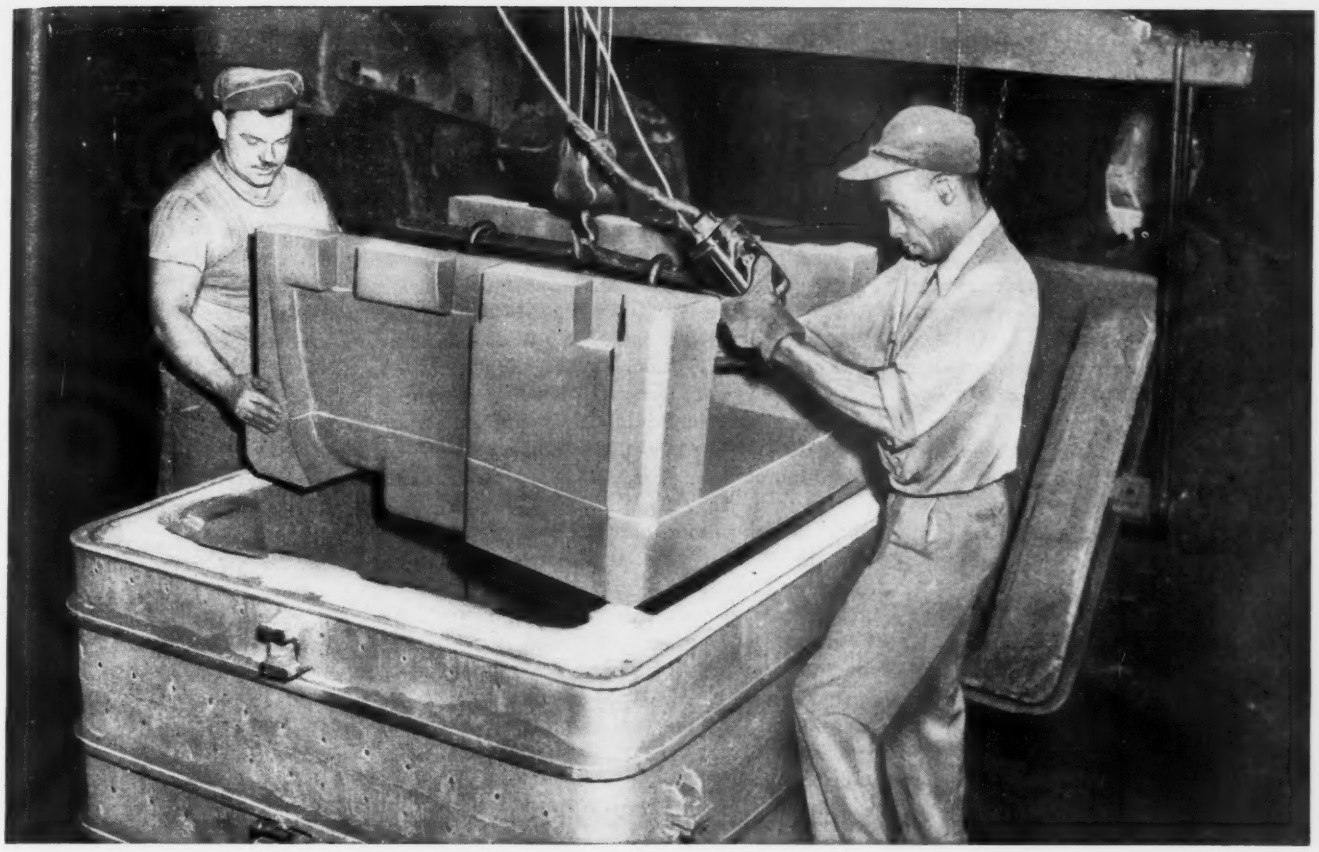

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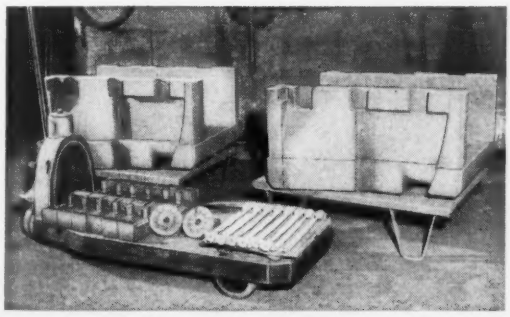

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"Our cores range in size from a fraction of a pound to over 700 pounds each. By the use of Delco Core Oil we are able to reduce overbake of even our smallest cores, although it is often necessary to bake these cores and our large, 700 pound cores at the same time. Breakage of our large cores is reduced to a minimum. In the last five and one-half years, we have not lost one of our large cores. Moreover, our stock cores do not show any moisture pickup when stored.

"We find that Delco Core Oil is economical to use because of its uniformity, its high strength, and its universal adaptability."

This report is typical of the results achieved in hundreds of similar operations throughout the country with Cities Service oils. If you're not completely satisfied with your present core oil, consult your nearest Cities Service representative or write Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE
QUALITY PETROLEUM PRODUCTS

(*Concluded from page 282*)

the return sand rises, the soda ash addition should be lowered accordingly. Our experience has been that ¼ to ½ lb of soda ash per ton of black facing is sufficient to hold the pH value at any desired level, once that level has been attained. This can be expected to vary widely from shop to shop. However, with soda ash costing less than $2 per 100 lb in quantity purchases, the cost is all but negligible.

Many foundrymen will desire some simple physical test for laboratory use along with pH control. These same foundrymen may not wish to purchase a viscosimeter. The test outlined here may prove of some value in correlation with pH and casting quality or clay quality.

Fig. 10 gives the details of the test as used in this study. Since the flow characteristics are also a measure of viscosity, simply timing the siphoning of the sand-bentonite slurry serves in a qualitative way. Comparison with Fig. 3 shows the pH giving maximum siphoning time to coincide (roughly) with the pH at which maximum yield strength occurred. The maximum retention of sand in suspension extends to pH values considerably higher. Perhaps the ability of the clay to hold sand in position at this high moisture content may correlate with service performance at a low moisture content.

This test applies equally well to black sands, although the amount of water to use with the sand must be determined by experience. A suggested way to start is with equal weights of sand and water. Adjust the pH to various values with soda ash, let it stand, then siphon off the top 75 per cent and see how much sand was retained in suspension. It may be only a laboratory curiosity; it also may be the test for which we are seeking.

It is not intended that pH control should be looked on as a "cure-all." It definitely is not. No amount of chemical can compensate fully for a poor sieve size distribution, poor molding or gating practice or any other such thing. It does, however, represent an important step in hog-tying that previously uncontrollable variable, clay.

These procedures are simple and relatively inexpensive. If your present pH should turn out to be your "best" pH, it is of particular value. Some day *your* sand may stray from the beaten path.

Acknowledgment — The authors wish to thank Hein de Jong, Demka Steel Foundry, Utrecht, Holland, for making the viscosity studies and Ray Henry, Unitcast Corp., for assistance with all tests and for the photographs used in this report.

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2. Taylor, H. F., discussion of Diran, L. M. and Taylor, H. F., "The Nature of Bonding in Clays and Sand-Clay Mixtures," *Transactions*, AFS, Vol. 60, 1952, pp. 356-363.

Reduction of Costs To Be Conference Theme

Ninth annual Plant Management Conference of the National Metal Trades Association will be held at French Lick, Ind., June 20-23. Theme of the conference is "Cost Reduction by Modern Management Through Good Human Relations, Supervision, and Methods." Prominent industrialists and business educators from all over the nation will conduct the conference sessions, which seek to keep NMTA members abreast of recent industrial developments. More than 500 executives and plant leaders are expected to attend.

Casting Buying

(*Continued from page* 105)

each vendor's performance. To accomplish this, we have developed a simple report form on which we enter from the invoices the number of castings billed, the weight, total dollar value, and average price per pound. Each invoice is recorded on this report, on the basis of the actual cost of the castings, disregarding such items as freight, bags or containers or test bar charges. Included in the report are the number of castings found defective and their weight. From these figures we compute the percentage of scrap loss by weight and the scrap loss by pieces.

Castings found to be defective, but which are salvaged because of the amount of machining time in them at the time the defect is found, are included as scrap castings. This report is maintained on a monthly basis, and the monthly reports are totaled, naturally, at the end of a year. This report gives us an opportunity to study each vendor's performance over a year's period and is beneficial in evaluating his performance as well as our own.

From the foregoing, it will have been noted that prime considerations are price and quality and that buying castings involves considerably more than the routine placing of orders. The matter of price as related to castings is not the easiest thing to understand. The foundry business being what it is, prices cannot be gaged as they can in the buying of staple commodities, such as hardware items, standard bearings or similar catalog items. The pattern equipment furnished determines how a job is to be made and may eliminate the possibility of producing a casting in the most economical manner.

Many factors, of course, affect the price of a casting. Metal specifications determine the cost of iron, for the higher the requirements, the higher the cost of the raw materials and alloys which will be used. Design of the part of course contributes greatly to the cost, particularly if it requires intricate and numerous cores. Finishing operations may add to the cost, too, inasmuch as cleaning heavily cored jobs require considerably more time than a simple tumbling operation.

Although we convert all our costs to a per-pound price for the purpose of analysis, we prefer to have a per-piece price. We have found that more and more foundries are becoming conscious of the need of a good cost system. In applying a cost system, we break all phases of the casting operation into units such as coremaking, molding and cleaning. To this is added cost of materials and metal cost. Our experience indicates that foundries which have these systems can price a job more thoroughly and more accurately than others.

Under these conditions, each job is priced on its merits. The relatively simple job does not carry the burden that it does when an over-all per-pound price or a per-pound price schedule is used. Use of a schedule method of pricing hides from the foundryman his true cost picture and in many cases serves only to drive out the simple jobs, leaving him the most difficult work with high costs, work which eventually will require a high price. Failing to face a true cost picture is like an ostrich hiding his head in the sand.

The per-piece price also is of material assistance in the handling of invoices and credits because it eliminates the ever present difficulty encountered in recomputing prices in the purchasing department. This recomputation becomes necessary be-

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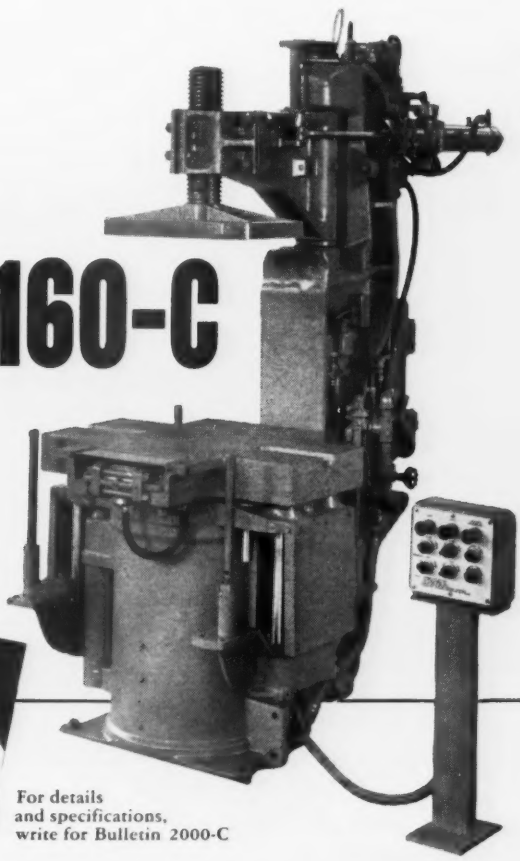

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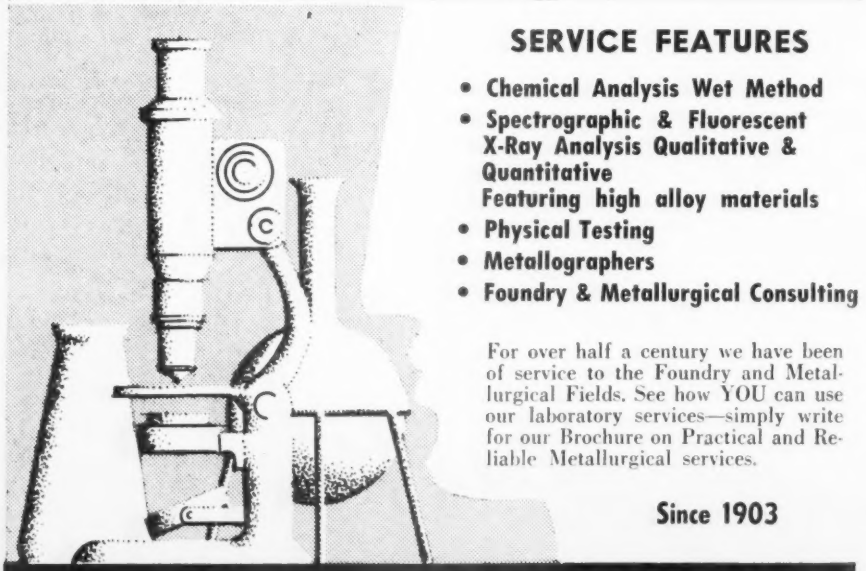

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cause of variations in weights, and I believe, we are all familiar with the reasons for weight variations. Sometimes, after a particularly strenuous week end, a molder finds it difficult to exert himself to his greatest ability on Mondays—and even on Tuesdays. We get loosely rammed molds and consequent swells. As buyers, we are not fond of paying for this extra weight so that our molder can stage a repeat performance on the following week end.

Practice in running jobs varies from foundry to foundry. In one case, a foundry may maintain that the best production and price can be obtained from the use of two patterns on a board, whereas actual checks reveal that when four patterns are mounted on a board, a much better price results. We believe that in working on a job, a foundryman must give thorough study to each part when he specifies the manner in which a job is to be made and the number of patterns required. Mounting too many patterns may result in using a flask size which requires ramming an unnecessarily large volume of sand. Conversely, mounting too few could result in the same thing, even though a smaller flask is used.

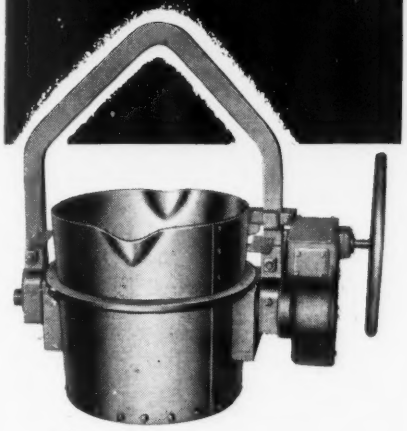
Scrap Is Expensive

Beyond the actual cost of a casting lies the lost cost of machining defective castings. Neither foundry nor shop likes to produce scrap. We find in too many cases, however, a lack of effective follow-through first in solving a particular problem and second in keeping it solved. One of the most difficult items to replace in the several years just past, when there was a peak of business activity, was lost machine time. Now, with some clear spaces in shops, it is imperative that we keep all machines producing good pieces. Because of this, pressure is mounting to insure that our sources produce usable castings.

By way of illustrating some frustrating experiences, I can recall one job in which a core shift occurred. A considerable number of castings was lost after 70 per cent of the machining was finished, at a cost of about $30 per piece. These castings were a complete loss to the buyer. The defect was called to the attention of the producer, of course, and marked blueprints were submitted, together with laid-out castings. The producer made a searching check on the job and could find no way in which the core could shift.

The telltale was perfect, and the core fit the prints in the mold perfectly. The core could not be made

Good-by Heat Distortion Worries



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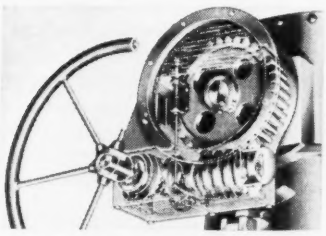

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to twist in any way to reproduce the defect in the casting. The producer was to check the contour of a replacement casting, to be made immediately, for a shift. With all of this background, all within the space of ten days, another run of castings was found to have the same shift, although the castings had been shipped as good pieces after having been checked. Only a checking gage, used at the insistence of the buyer, prevented further scrap because of the shift. But the producer does not know yet what went wrong with the job or how corrections were made.

Another defect which caused considerable expense occurred in a 1600-lb casting produced at an average rate of 20 per month. The defect first came to light when the end user began breaking the castings in service, although he was using the equipment in accordance with specifications. Engineers for the buyer's company checked the job in operation on the units and verified the fact that specifications were not being exceeded. One of the castings which failed was returned for inspection.

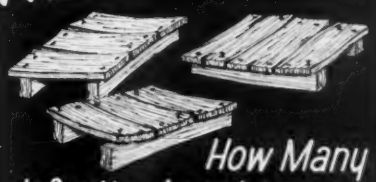
Corebox Equipment Misused

This inspection revealed nothing unusual, and a decision was made to break up the casting. Inspecting the broken-up casting revealed a sharp corner in a cored hole which should not have been there. Its presence indicated, however, that a crack was in the casting when it was made. Corebox equipment was checked, and the trouble was traced to the misuse of a loose piece in the corebox. The only difficulty was that a coremaker could not have reproduced the error for $500. Yet the defect was found in at least 19 castings, although fortunately most of the in-process parts did not have the defect.

We noted earlier that design very often has an effect on the price of a casting. We have found many instances in which simple design changes, such as running bosses to the parting line or changing contours, would eliminate cores. In some instances, changes of this type permit a job to be changed from a relatively costly core mold to a simple squeezer job. It probably is a good guess that a lot of pattern equipment currently in shops is not designed for the most economical production. Undoubtedly many of these patterns found their way into the foundry without any questions having been raised as to design simplification possibilities.

The foundryman well may find, if he takes the time to study these jobs and consults with the buyer,

REPLACE THESE PROFIT STEALERS



How Many defective boards are on your production lines? Check and find out

PUT YOUR MOLDS ON A SOLID FOUNDATION

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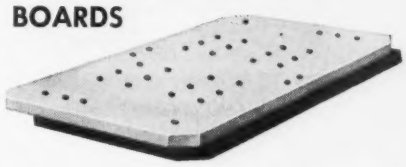

- One piece—can't warp, twist, burn, or come apart
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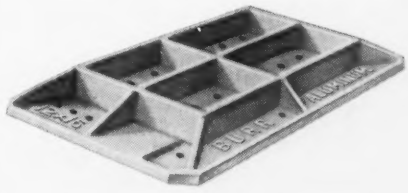
- Last indefinitely



GET THE FACTS TODAY

We can prove that replacement of wood boards with Burr Aluminum Permanent Boards will save you money.

Write for full information and prices.

BURR ALUMINUM
Box 31 Burr Oak, Michigan

that much more suitable equipment could be furnished. Too often, in our experience, we have been faced with the problem of preventing a foundry from going to a more difficult and expensive method of molding a job. I believe that most engineering departments will be receptive to any reasonable requests and will be willing to accommodate a foundry in an effort to reduce costs. Here truly is a field in which the foundryman can be of material assistance to his customers simply by being aware of the jobs in his foundry and by taking the proper course of action when necessary. It is a field in which he should take the initiative.

Today, quality control departments are in the ascendency. Quality in castings is, of course, of prime importance to the buyer. Quality control in the foundry itself concerns controlling on a quality check basis the various factors which may affect the end product. Core sand mixes, heap sand mixes, green strength of sand and chemical analysis of the melt are items on which quality control standards can be applied. Except for the fact that installing such a system indicates progressiveness, it is of no direct concern to the buyer.

Buyers are concerned primarily with your end product and the quality in it. Are cored holes clean and free from fins? Do external and internal appearances meet agreed standards? Does the casting conform dimensionally to the blueprint —that is, is it free from shifts, sags, or swells? These things can occur in a casting in spite of quality control.

It is our feeling that a quality control system should be augmented by provisions to check mold hardness and setting of cores, by a method of periodically checking core dimensions against blueprints to watch for corebox wear, by checking gating and risering as related to the final castings and perhaps by constant checking to avoid pouring short. It is through these types of preventive checking, or quality control, that many defects can be avoided.

Controls Need Supervision

These checking operations seem to fall within the scope of supervision. Whether or not this obligation of supervision properly falls under the direction of a quality control supervisor may vary with organizational policy. It seems imperative, however, that responsibility be placed in capable hands. All of the time and effort expended in controlling the quality of raw materials, sand mixes and melting processes are of no avail unless there is a follow-through in the mechanical procedures. Many times, we find, supervision is spread much too thin to do an effective job.

Then, too, capable personnel must be trained for supervisory positions in the cleaning room. In some cases we find that a great effort is made to have at least one person in the cleaning department act as the inspector. He checks castings for dimensional accuracy, for cleanliness in finish and for location of cored holes. We recently have indicated to our sources of supply our willingness to go along in the matter of providing special, inexpensive checking gages, prepared in our tool design department, to assist in the proper checking of troubles before castings get into the machining processes, where many of the dimensional troubles first come to light.

If defects can be found shortly after the castings are poured, corrections can be made before too many defective castings are produced and result in costly reworking operations through special setups, or, even worse, in the complete loss of machin-

(*Continued on page* 290)

PORCELAIN PRODUCTS Porite
STRAINER CORES

Pay for themselves.
Reduce scrap losses.
Cut machining time.
Reduce chipping, welding, grinding.
Improve casting quality.
Eliminate time spent making your own strainer cores.
Resist heat shock.
Non-spalling.
Won't erode.
Free of gas.
Not affected by moisture.
Take rough handling.
Always in perfect condition.
Flat and uniform.
Control metal flow.
Sold for less than you can make cores in your own shop.

YOU BE THE JUDGE
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60 years
Porcelain Products, Inc.
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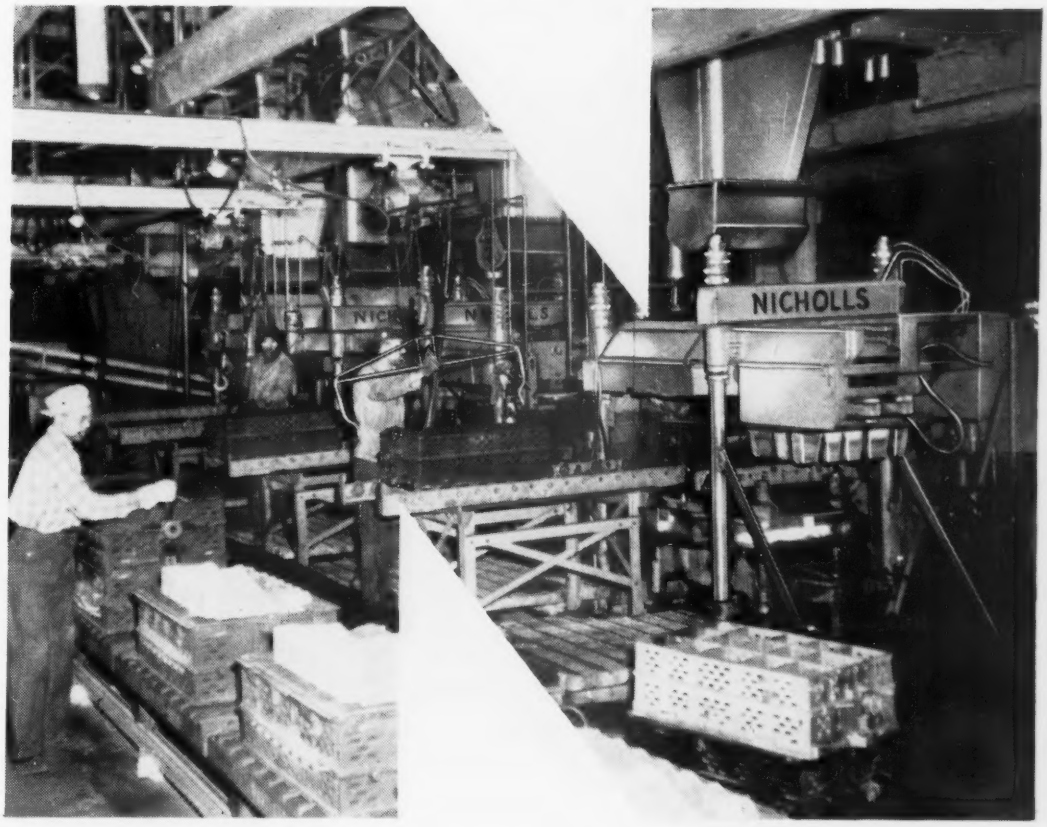
Wherever The Best Molding Equipment Is a Must... It's NICHOLLS...



A battery of NICHOLLS "push-button" automatic molding machines in a large Cleveland foundry.

The Heavy Duty Molding Machines That Have Everything!

- ***"Push-button" automatic control to eliminate dangerous risks.***
- ***Precision-built for years of service.***
- ***Quality construction for finer molds continuously.***
- ***Fully automatic operation.***
- ***Greater molding economy than you've ever known.***

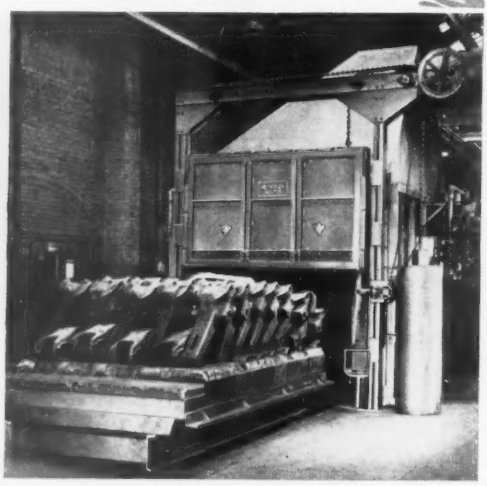
There must be a reason why so many of the country's top manufacturers choose Nicholls equipment. And there is. It's the same reason why *you* will want to specify Nicholls Jolt-Squeeze and Pattern Draw Molding Machines—Ease and economy of operation, low maintenance costs—and the best possible molds every time.

For complete information, write:
Wm. H. Nicholls Co., Inc., Richmond Hill 18, Long Island, New York.

NICHOLLS

For Normalizing, Annealing and Heat Treating...

JOHNSTON CAR BOTTOM FURNACES



Engineering experience is apparent in the smooth operation of the Johnston Car Bottom Furnace. Roller bearings in car and door hoist shafts, mechanical car seals, and power operated car pullers are just a few of many practical features. Johnston "Reverse Blast" low pressure burners for oil or gas assure clean, economical, efficient heat for annealing, normalizing, and stress relieving.

Write for Bulletin F-240

Johnston Equipment for the Foundry
● Melting Furnaces ● Heating Torches ● Ladle Heaters
● Heat Treating Furnaces ● Burners, Blowers, Controllers
Over Thirty Years Experience in Design and Manufacture.

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ENGINEERS & MANUFACTURERS OF INDUSTRIAL HEATING EQUIPMENT

30,000 and 40,000 pound

Universal

Testing Machines

These low-cost machines will answer all your questions about the tensile, transverse, and compression strength of metal parts. They will apply up to the equivalent of 200,000 lbs. per sq. inch (on a .505 specimen).

Only two simple controls operate these hydraulically powered, automatic machines. Large gauge gives accurate reading instantly. Weight: 500 lbs., height: 4'-4". Equipped with motor, gauge, grips, and blocks.

Ask us for more information or send us your requirements for a quotation, as this Universal machine can be modified many ways.

Standard and special Brinnel hardness testers, ductility testers, and tensile testers also available.

DETROIT TESTING MACHINE COMPANY

9382 Grinnell Avenue, Detroit 13, Michigan

(*Continued from page* 288)

ing time because remachining operations cannot be carried out.

A recent incident concerned a large casting on an order for one piece. Shortly after receipt of the casting one exceedingly irate shop superintendent called me to look at this casting. Frankly, I have seldom seen a casting in a more miserable condition. The casting was pitted, it was full of sand and dirt, and many corners were broken completely away. To salvage this casting—and I should say that in our particular field we discourage welding as much as possible because we insist that it is up to the foundry to ship usable castings—probably would have taken more weight of welding rod than there was weight of casting. Anyone conscious of defects simply would not have allowed that casting to be shipped.

Complaints Are Repetitive

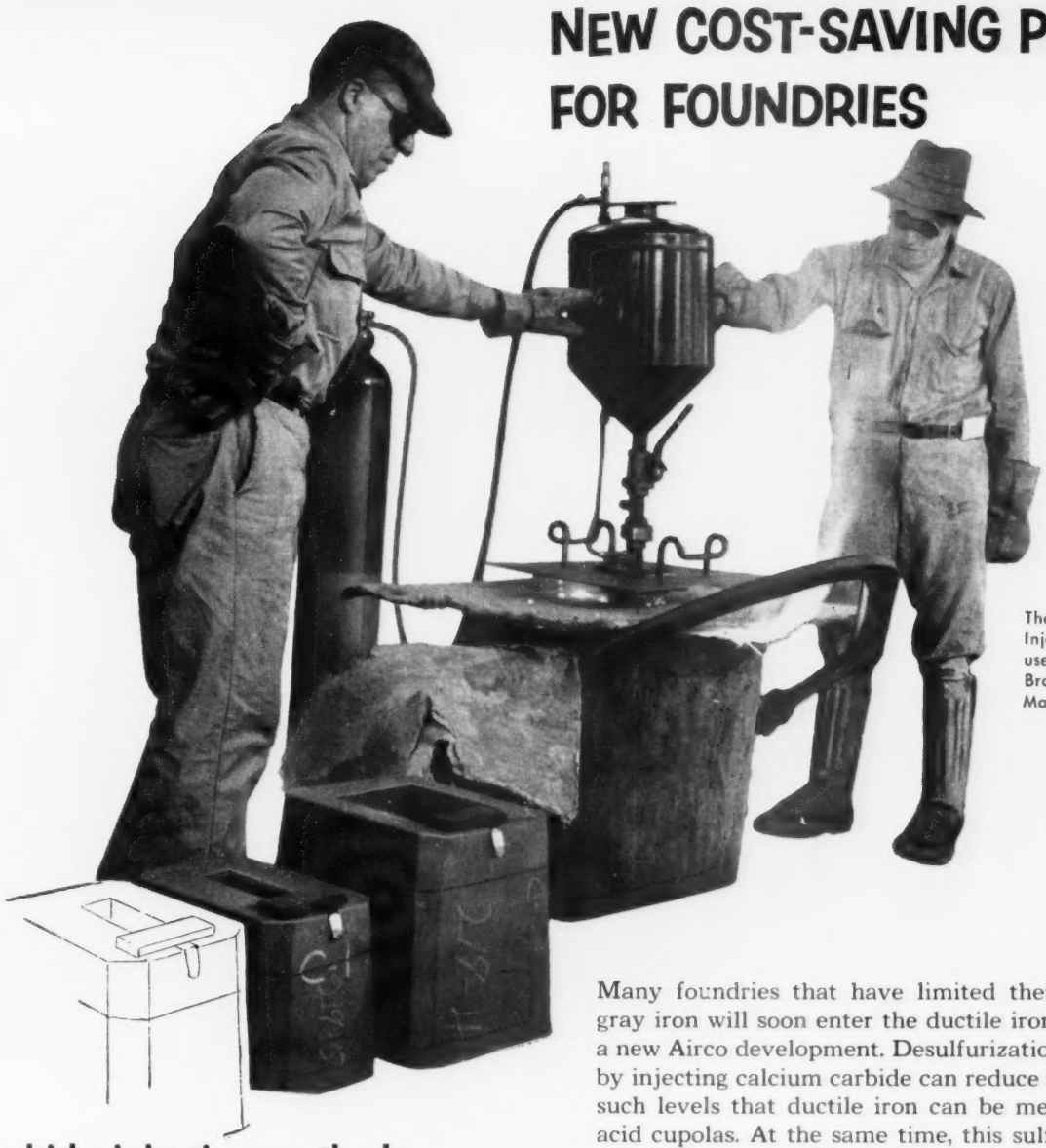
We encounter many situations like this constantly. Many complaints are repetitive in nature, like a recent experience. On three occasions I had complained of an exceptionally heavy fin in a casting. We spent considerable time in our own paint shop chipping the fin out of the casting, as should have been done in the foundry in the first place. The report back after each complaint was that the coreroom had been careless in the core assembly—the casting is a dry sand job—and that the foundry would watch the job closely in the future. Yet the fin appeared from time to time. During a recent visit to the foundry, I requested them to make a set of cores so that we could check the job. As the cores were assembled, any one with the slightest knowledge of casting processes could have told that the fits were just plain sloppy. It is a wonder that any good castings at all were produced.

I can recall standing in a foundry with the superintendent one day, some years ago, watching one of our jobs being molded. The molds were on the floor, and the molder was getting ready to set the cores. He picked up the first core and with almost the same motion picked up a file to file the prints, in what could only have been a weak effort to make them fit the prints in the mold. The supervisor did nothing. How could he justify the risk of a lost casting on that run because of the lack of foresight in replacing an inexpensive core print? This is the sort of thing which well trained supervisors should avoid.

In citing these instances concerning quality, I am trying to illustrate

(*Continued on page* 292)

NEW COST-SAVING PROCESS FOR FOUNDRIES



The Airco Carbide Injection Process in use at the American Brake Shoe Company, Mahwah, N. J.

Carbide injection method developed by AIRCO® cuts ductile iron alloy costs up to 50 percent

permits melting in acid cupolas

Many foundries that have limited their production to gray iron will soon enter the ductile iron field, thanks to a new Airco development. Desulfurization of molten iron by injecting calcium carbide can reduce sulfur content to such levels that ductile iron can be melted in ordinary acid cupolas. At the same time, this sulfur content — as low as 0.01 percent — makes it possible to cut the amount of expensive alloy elements drastically with no sacrifice of mechanical properties. Foundries already using Airco carbide injection report savings of up to 50 percent on these alloy costs alone!

The injection equipment itself is simple and inexpensive. It consists of a hopper and an injection tube through which the powdered carbide is injected into the molten iron by a stream of nitrogen. The operating expenses are the cost of the gas and the carbide, trivial in comparison to the savings they make possible.

Calcium carbide injection is a fruitful result of Airco Technical Service's constant effort to find new profitable techniques for customers. If you have a welding, cutting or metallurgical problem, why not let Airco help you develop the most practical approach to it? It can pay big dividends.

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Radiographing a flange on a heavy steel casting.

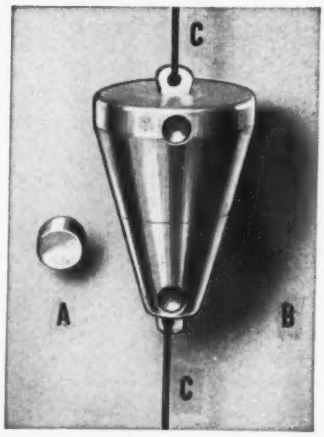
BUY . . . RENT OUR RADIUM . . . OR LEASE RADIOGRAPHY KIT

. . A Short cut to more productive and economical foundry practice

The use of gamma rays in radiographing steel castings has greatly increased since 1930, when the first commercial use of radiography was introduced. Radium radiography is simple, economical and effective; because it may be rented or leased, the equipment doesn't require a capital investment. It is simple to operate because it doesn't require especially skilled operators. Today radium radiography is rapidly approaching the status of standard equipment in progressive steel foundries. Let us tell you more about the simplicity and economy of radium radiography. Write today for prices, terms and case histories. Your requirements promptly supplied.

RADIUM CHEMICAL CO., INC.

161 East 42nd St., N. Y. Chicago: Marshall Field Annex Bldg. Los Angeles: 3723 Wilshire Blvd.



The apparatus is as simple as
A—small radium capsule
B—cartridge container
C—rigid string support

Here's what Industry has to say about REDA melting Furnaces . . .

nothing but praise for the REDA FURNACE . . .

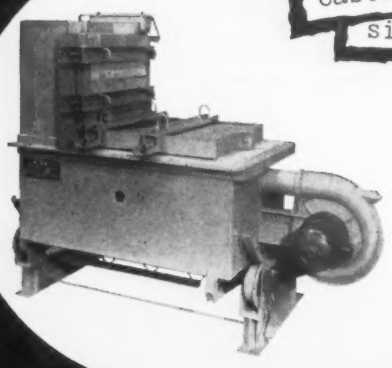
has improved overall foundry operation . . .

doing a wonderful job . . .

much more flexible . . . entirely satisfactory .

castings come cleaner . . .

sincerely recommend it . .



Reda Stack-Loading melting furnaces for ferrous and nonferrous metals have been designed and built by experienced foundrymen for foundrymen everywhere. That is why Reda furnaces provide advantages far beyond those found in other, and more expensive types; that is why, with Reda furnaces there is less down time for maintenance, longer uninterrupted melting runs, and lower melting costs.

Another feature is the Reda Burner arrangement which can operate from oil and gas simultaneously or be switched from one fuel to the other instantly. *Write or phone for complete details.*

REDA FURNACE

REDA PUMP COMPANY • BARTLESVILLE, OKLA.

(*Continued from page* 290)

problems resulting from improper handling of the jobs in the foundry, from coremaking through the cleaning operations. Each casting which is not in accordance with the blueprint for reasons other than defective pattern equipment—that is, defective because somewhere along the line someone did not do his job—causes lost time and added expense in the buyer's plant. Castings which are not uniform from piece to piece must be handled as individual pieces and many times require a layout of each piece and necessitate the machining of the piece from the layout. Castings which are shipped improperly cleaned cause added expense in additional cleaning operations. Castings with poor surface finish often are worked over to give them proper appearance.

Must Agree on Standards

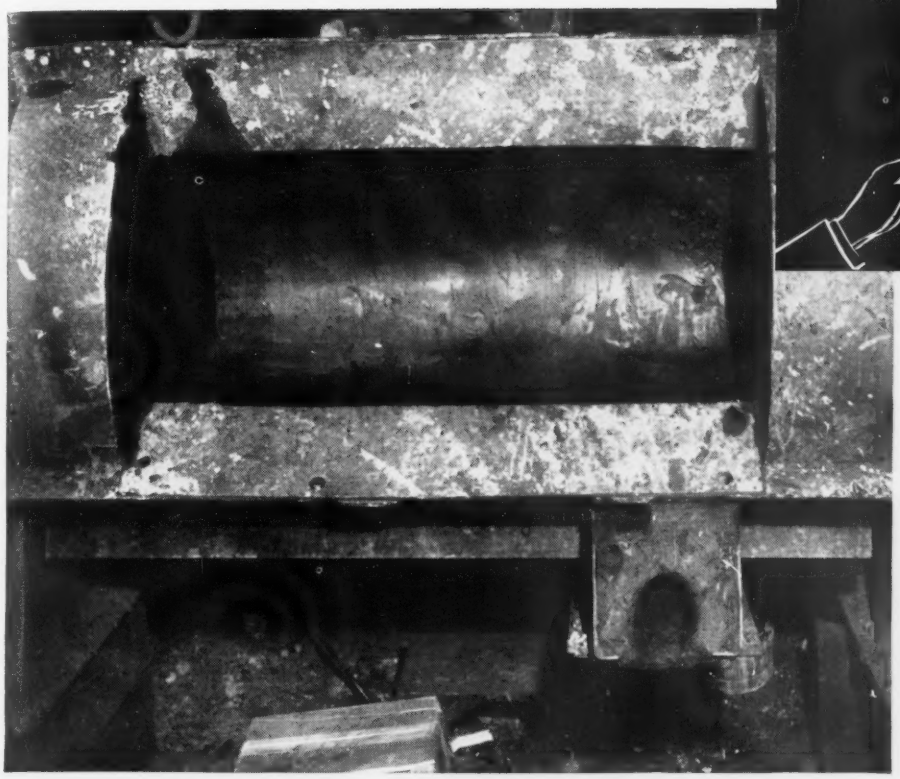
I realize that that there is no known standard for finish of exterior or cored surfaces. In machining operations, the engineer can specify the finish which he desires, even as fine as a micro-inch finish or light band flatness. The best way to learn a buyer's requirements on an item such as finish is to determine what is acceptable by discussion. Once a standard between producer and buyer is agreed upon, however, it is up to the producer to see that his men carry out the obligation. These details of quality quite probably never confront the man who does casting buying, but they are of utmost importance in buying castings.

Now we don't expect a foundry to stand the cost of maintaining pattern equipment. Yet the foundry is in the best position of all to keep a good watch on pattern equipment. By simply apprising the buyer of the need for repairs, he can avoid the possibility of losing castings.

Assuming that a lot of castings is received with a core shift which renders the castings unusable, the buyer, in the absence of knowledge of the cause of the reject, is most likely to order the castings returned for credit, and this at a time when it is much too late to do anything about something as simple as a worn core print. Many times the foundry can handle these simple repairs and bill its customer. If the repairs are extensive, asking for permission to return the pattern for repairs not only will put the equipment in first-class condition, but also will give the buyer an opportunity to have the pattern completely checked dimensionally.

Quality in castings is an important item to the buyer of castings.

(*Continued on page* 294)



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"LOK"ing out the destructive affects of metal oxides and slags for greatly increased service life is the feat performed by Walsh Graflok Plastic Ladle Lining.

ADVANTAGES:

Easier Flow of Metal • Reduces Wear on Lining • Graphite Lubricating Effect Cuts Slag Adherence—Makes Removal Easier • Slashes Refractory Cost Per Ton of Metal Melted

USES:

- **Receiving and Mixing Ladles**
- **Bull Ladles, Hand Ladles—All Types of Foundry Ladles**
- **Spouts of Cupolas and Malleable Iron Furnaces**
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Walsh also makes—Graflok Ladle Coating. In dry form, in 100 lb. waterproofed bags, ready for immediate use by the addition of water.

Packed in 100 lb. waterproofed cartons—ready for use—sliced for ease in handling and in dry form for operators preferring plastic consistency for their particular needs. Packed in 100 lb. water proofed bags, for mixing with water on job.

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FOR LONGER LIFE . . . LOWER COSTS. Bonded together with an extremely tough resin for added durability. Textile reinforcement provides maximum on-the-job safety . . . extra protection against breakage . . . longer life under continuous operation.

FOR A WIDE SELECTION . . . PROMPT SERVICE. Nu-Tex Depressed Center and Straight Disk Wheels are now available in popular diameters and thicknesses for all types of finishing. Grades range from 0 (hard) to 6 (soft). Write for complete details. Atlantic Abrasive Corp., 534 Pearl Street, South Braintree 85, Mass.

ATLANTIC ABRASIVE CORP.
South Braintree 85, Massachusetts

LIFT-O-KRANE is rough, tough and ever-willin'

With this versatile LIFT-O-KRANE you can do the impossible . . . Use it as a Crane Truck, a Fork Lift Truck and/or as a Ram Truck.*

Silent Hoist heavy duty LIFT-O-KRANE is designed to make the most difficult job "all in the day's work." Take, for example, one of the 5 ton capacity LIFT-O-KRANES in daily duty at SUN OIL COMPANY, Marcus Hook (Pa.) Refinery. Here it is shown easily handling a bulky, unbalanced, heavy-to-handle accumulator tank. Its next job may be dragging lengths of pipe lines and locating them properly in ditches . . . then lifting and moving giant valves and heat exchangers and installing them in their proper place in the refinery lines. According to one Sun Oil executive, LIFT-O-KRANES lift and serve, day after day, with efficiency and dispatch, and *replace entirely any need for regular cranes.*

***3-IN-1 MACHINE:** With integrated BOOM Attachment—handle Hook Loads. With RAM Attachment—handle Hollow-Center Loads. With its FORK Tines—handle Timber, Machinery, etc.

You, too, should investigate the tough, maintenance-free service of LIFT-O-KRANE Combination Machine . . . and LIFTRUK Heavy-Duty Fork Truck . . . in 5 - 7½ - 10 - 15 ton capacities. Send for Bulletin 77.

SILENT HOIST & CRANE CO.
Pioneers of Heavy Duty Materials Handling Equipment
885 63rd Street, Brooklyn 20, N. Y.

(*Continued from page* 292)

and it is an item which warrants constant watchfulness and attention to each small factor involved in the production of sound, clean and metallurgically standard castings. In average, day-to-day production, provisions for checking castings for shrinks or blows or voids usually are not provided. The use of x-ray, Magnaflux or other accepted testing procedures usually is reserved for checking large or expensive castings. The best known method of avoiding these types of defects is through the continued vigilance which is a part of the service the foundry is selling to its customers.

Up to this point we have discussed jobs which were current or had been produced previously. In reviewing a blueprint covering a new job, it is our practice to look at it first from the standpoints of design, complexity of core work, whether the job is a heavy section or light section job or, worse, a combination of light and heavy sections, metal specifications and potential quantities involved. Upon completion of this check, we decide which of our present sources is best equipped to handle the job.

Advises Foundry About Jobs

When the character of the job is similar to existing jobs, the foundry still is advised in most instances of the pending job and of what our intentions are. With most new jobs, however, the blueprint is sent to the foundry selected to run the job for their pattern recommendations. Often the recommendations include suggestions for design changes.

In our case, we have no pattern shop and, consequently, order patterns from commercial shops. It is our feeling that familiarity with a new job from its inception aids the buyer in future handling of it. A knowledge of pattern and foundry terminology and practices is an asset to a buyer of castings, whereas the casting buyer need not concern himself with it.

One of the things which any buyer always looks for is the promptness with which a supplier handles and delivers his orders. Needless to say, failure to deliver on time usually for one thing results in costly expediting and secondly creates the need for difficult rescheduling for his production department. When jobs are in an assembly department waiting for a final casting, it means that when these overdue castings are received, they must be rushed through the machine shop in order to complete the job and keep the company's customer happy. Costly rescheduling is encountered, but even worse is the possible effect on good will.

(*Continued on page* 296)

For faster shell molding
at lowest cost, try RCI
FOUNDREZ 7500

With Reichhold's two-stage, thermosetting, powdered phenolic resin — FOUNDREZ 7500 — you'll speed up your shell mold curing cycle because this remarkable resin is formulated to cure at high temperatures.

When you produce shell molds with FOUNDREZ 7500, you get castings which are smoother-surfaced, and have closer tolerances. You have fewer finishing operations and rejects . . . use less resin and sand.

If you produce precision castings in big standardized runs, you can mechanize your production completely with this simple process. RCI engineers stand ready to guide you. For full details, write for Technical Bulletin F-3.

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A MIXTURE OF FOUNDREZ 7500 and sand is poured into a dump box, to which hot pattern will be attached.

Synthetic Resins
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Phenol
Glycerine
Phthalic Anhydride
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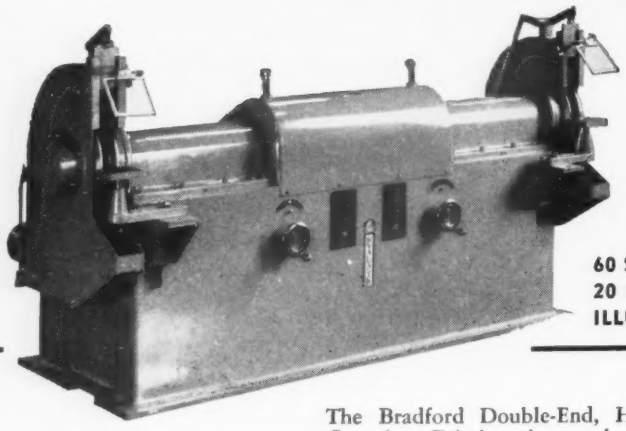
Let BRADFORD

SPEED YOUR GRINDING WORK—

Standard or Special



60 SIZES AND MODELS
20 HP. Model ILLUSTRATED

The Bradford Double-End, Heavy-Duty Snagging Grinder shown above is just one of many Bradford designs that help speed foundry production and reduce costs. With individual, infinitely variable speed drive, both wheels can be used simultaneously or individually at same or different speeds. Fixtures can be supplied to adapt this grinder to special purpose work or special models can be designed to meet your requirements. Let Bradford engineers help solve your grinding problems—you'll profit.

THE BRADFORD MACHINE TOOL COMPANY
661 Evans Street, Cincinnati, Ohio
Precision Since 1840

Fast, Accurate, Economical METAL ANALYSES

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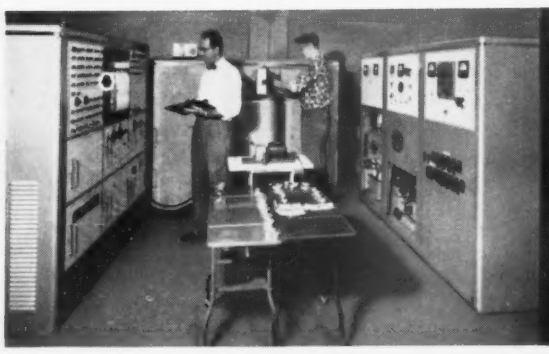

Provides SPECTROCHEMICAL ANALYSIS that evaluates ALL elements with TWICE THE ACCURACY AND SPEED of the standard Spectrographic determination . . . TWENTY TIMES THE SPEED of routine chemical processes.

24 HOUR SERVICE, by air, wherever your location. All routine samples are analyzed the same day they are received . . . results reported by phone, wire or airmail . . . at extremely moderate cost. Send today for PRICE LIST, PROCEDURES and OTHER SERVICES available.

PDQ Service with the PCQ*
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FREE FOLDER GIVES YOU THE FACTS AND PRICES FOR THIS Speedy Economical Service

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Chemical and Spectrographic Analysts
2456 West 38th Street Chicago 32, Illinois

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CITY..... ZONE..... STATE.....

(*Continued from page* 294)

Presently, we are in a period in which on-time delivery is not difficult. But when a vendor—and this applies not only to foundries—oversells his capacity in relatively free times, he cannot deliver the goods to any of his customers when production again reaches a full level. It is not my purpose to judge the manner in which our vendors operate their business, but it is our concern to judge our vendors on the basis of their performances.

It probably is apparent that the job of buying castings is a lot more complex than may appear on the surface. We believe that it is beneficial to have the men on each side of the desk familiar with each others' problems. In most organizations, the various departments must work cooperatively to obtain the best results. Perhaps a good viewpoint, if not the best for a sound vendor-buyer relationship, is for the vendor to consider himself a department of his customer's plant. With this thought as a basic approach, both the interplant departments and the 'vendor department' can work together to do an efficient and economical job.

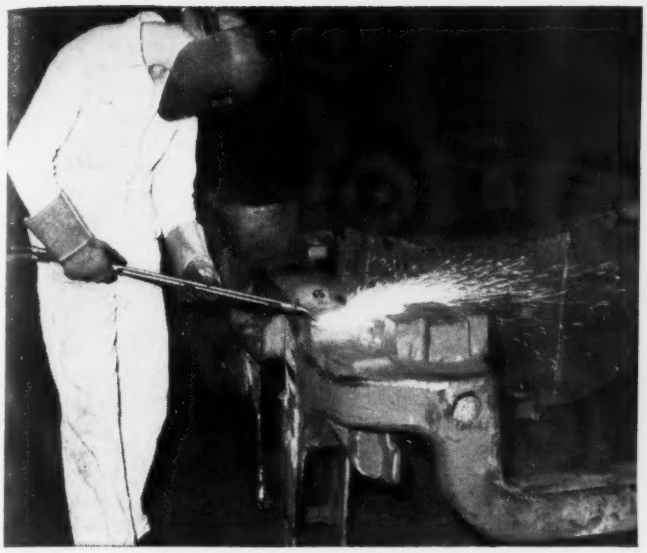
Share Knowledge with Others

In using this approach, one of the first considerations should be, "what are you, the foundryman, doing to make available your knowledge of foundry techniques and requirements?" The foundryman or his salesmen should take advantage of every possible opportunity to talk to engineers. From time to time he may be able to help in a design problem and show how a drawing can be changed to improve the castability of the part. True, he may not always be able to convince an engineer, for the engineer naturally feels a proprietary right and on this basis alone may reject his suggestion. However, a visit which ends this way is not necessarily lost. If it is handled intelligently, the engineer will respect the representative's knowledge and will be more receptive to suggestions as time goes by.

Another place in which he can spend his time to great advantage is in the inspection department or in whichever other department is charged with the responsibility of making decisions regarding casting quality. In most cases that is where he can learn the practical answers pertaining to end use. Many times he will find that requirements which seem unimportant actually are critical in nature.

For example, our castings are used in hydraulic applications. Our designs have been developed to the point where many valve holes are

(*Continued on page* 298)



Powder-washing blowpipes have replaced swing grinders and chippers in removing defects and riser pads from railroad diesel trucks. Work is done faster and more efficiently—preheating is rarely necessary.

Powder-washing blowpipes remove riser pads in locations virtually impossible for other methods. Risers between flanges of this valve body have already been washed away—note the smooth clean finish.

Why Powder-Washing is a Standard Tool in Modern Foundries

Powder-washing is the fastest, most efficient method for gouging and removing fins, pads, and stubs from casting surfaces and hard-to-reach places.

* Powder-washing is faster than grinding or chipping, and finished surfaces are clean and smooth.
* Powder-washing tools are quiet, easy to operate, and less fatiguing than chipping tools and grinders.
* In powder-washing, metal powder is added to the washing flame. This raises its temperature, and provides greater speed and control in cleaning sand and metal from castings. This process is effectively used to gouge or wash iron, steel, bronze, and some of the more complex oxidation resistant alloys.

Your local LINDE representative will be glad to give you detailed information on the powder-washing process, and help you determine the setup to best serve your foundry needs. Save time and money—call him today.

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A Division of Union Carbide and Carbon Corporation
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Division of Union Carbide Canada Limited, Toronto

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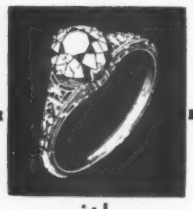
CASTINGS GLITTER LIKE



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Operators of continuous pour cupolas report CARBOFRAX silicon carbide blocks retain correct hole size, even through long runs. They are completely dependable—your best way to avoid costly slag hole failures. One trial order will show why. For further data, write Dept. V-64, Refractories Division, The Carborundum Company, Perth Amboy, N. J.

Use slag-hole blocks by

CARBORUNDUM

Trade Mark

"Carborundum" and "Carbofrax" are registered trademarks which indicate manufacture by The Carborundum Co.

(*Continued from page* 296)

cored into the castings to eliminate the necessity for additional valve castings. By doing this, we have been able to eliminate a considerable amount of exterior piping and valving to carry the flow of oil. On the other hand, we have aggravated the casting problem, particularly with respect to clean cored holes which carry the flow of oil.

Fins and burned-in sand are highly objectionable because under the constant rapid flow of oil, sand or particles of fins can be carried into the system and, in many cases, can affect the performance of a pump by scoring the piston hole walls in the cast iron cylinder. Yet to one not acquainted with the problem it would appear that we are supercritical in this respect. We encourage our suppliers to visit our plant, however, and we take time to explain the harmful effect of the defects in coring.

Salesmen Need Training

While we are on the subject of plant visitation, I hope it will not be taken amiss if I say a few words about foundry salesmen. We have found in a number of cases that salesmen call who have little or no background in the foundry industry. In all honesty, this is not good representation. As I have noted previously, the foundryman or his salesman can work to good advantage through a buyer with engineering, inspection and quality control. He should be qualified to discuss design, metallurgy, heat treatment, and other relevant factors.

Unless he can carry on in these fields, he is not giving the representation the foundryman should have. We also should note here that although we encourage plant visitation, it always is best to carry on these visitations through the buyer since he is ultimately the man who places the orders and he should be aware of the vendor's accomplishments in solving problems if he is to pass judgment fairly. But the salesman who is not qualified to discuss foundry problems intelligently is wasting both his own time and the buyer's time.

A problem which is perhaps more far-reaching than the problem of proper supervision is the apparent lack of an extensive training program in the foundry. In the foundry business, as in most, it is essential to have men well grounded in fundamentals. This goal requires a thoughtful training program. Gating and risering alone are items which require a thorough understanding of the basic principles of the casting technique.

(*Concluded on page* 300)

One wash... many uses...

saves you time and money

ZIRCONITE* Paste Wash is called a "universal" wash. To be specific, here are a few of its many applications in steel, iron, bronze, aluminum and magnesium foundries:

For green and dry sand cores and molds, metal chills, permanent molds, stirring rods, skimmers, thermocouple tips, crucibles, ladles, runners, furnace spouts and heat treating furnace brick.

It also is used successfully as a patching material for cores, ladles, furnace linings, and similar applications.

The proof of performance is in its properties. It will not fuse with molten metal, it resists metal wetting, prevents metal penetration and produces smooth casting surfaces.

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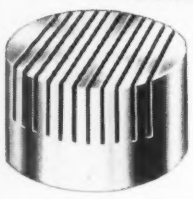
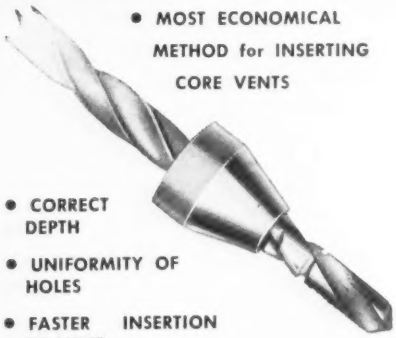


X-TRA DEEP HEAD .156 Wide Slots .014

DEEP HEAD .093 Wide or Narrow Slots .014 .010

SHALLOW HEAD .031 Wide or Narrow Slots .014 .010

INSERTING DRILL



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(*Concluded from page* 298)

In our particular situation, we find it necessary to issue a great number of purchase orders for one piece, and because of these requirements, it is becoming increasingly difficult to find sources which want to do this type of work, let alone which can do it. It may seem odd that we should be concerned with this matter from the buying standpoint. We are concerned because the basic nature of the foundry industry requires that it continue to prepare and execute a training program carefully. The program should be designed to teach the very fundamentals so that the foundry will be able to take care of the low-quantity buyer as well as the buyer of production quantities.

As noted earlier, it was my thought to have an object rather than a subject. My object, which we have been working toward through these remarks, has been to show the way toward establishing a closer working knowledge and understanding between buyer and seller. Even in the opinion of some of the vendors with whom we have gone a long way in establishing this understanding, this point is one which needs more development. If we are to meet the ever increasing demands for improved performances from the products we manufacture, then we necessarily must depend more heavily upon the background and skill of the foundryman. Similarly, the foundryman must be ever on the alert to the increasing requirements.

Industry Is Basic

The foundry has remained a basic industry down through the years primarily because of the rugged individualism of the men in the industry. Surely the foundry is not the most attractive place in which to work. Yet in the foundry can be found a wealth of romance. The blending of scrap metals, pig iron and coke in the cupola to achieve molten iron is a process which never can fail to thrill. To watch the same molten metal poured into a mold and to observe the end result, a material to do a specific job, cannot help but leave a lasting impression.

Foundrymen have coped with their technical and production problems. The problem now is to work at the customer level to strengthen the knowledge of end use, to assist in development work and to work through the men who do the buying for a sound, co-operative working basis for betterment of both vendor and supplier. These problems seem minor in proportion, but still are vitally important. They are problems which, I am sure, the foundry industry can and will meet.

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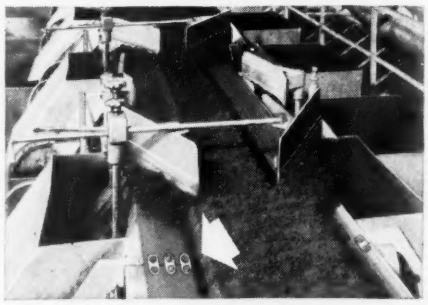
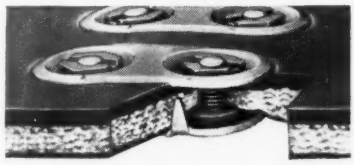
FLEXCO SCRAPER PLATES



FOR JOINING CONVEYOR BELTS WHERE SCRAPERS AND PLOWS ARE USED



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TRADE PUBLICATIONS

For more details on these items use reply card—page 267

FOUNDRY EQUIPMENT: Jeffrey Mfg. Co., First Ave. and Fourth St., Columbus 16, O.—Catalog 845 presents information on company's line of sand handling and conditioning systems, flaskfillers, hoppers, automatic measuring boxes, mold conveyors, pouring conveyors, mechanical vibrators, steel apron and trolley conveyors, belt conveyors, belt idlers, paddle sand mixers, breaker screens, portable buckets and other types of foundry equipment. Photographs, schematic diagrams, dimensional charts and specifications also are included.
For More Details Circle No. 101—Page 267

CAST ALLOY REPRINT: Alloy Casting Institute, Mineola, N. Y.—To aid designers in the use of high-alloy castings, the institute has made available reprints of the paper, "Resistance of Cast Fe-Cr-Ni Alloys to Oxidizing and Reducing Flue-Gas Atmospheres." Attention is directed toward the influence of sulphur content on corrosive attack by hot gases.
For More Details Circle No. 102—Page 267

SHELL WARPAGE: Shalco Engineering Corp., Palo Alto, Calif., and Shallway Corp., Connellsville, Pa.—Problems encountered in shell warpage during shell molding, and suggested methods of correction, are covered in bulletin 303.
For More Details Circle No. 103—Page 267

ABRASIVE SHOT: Abrasive Shot & Grit Co., Springville, N. Y.—Complete range of shot and grit to meet cleaning and peening needs including consumption and specification charts is presented in catalog AB-53.
For More Details Circle No. 104—Page 267

FRAME GRINDERS: Fox Grinders Inc., Oliver Bldg., Pittsburgh 22 —Illustrated folder contains specification data on two high-speed swing frame cut-off machines, five swing frame grinders and four stand grinders of various sizes and capacities.
For More Details Circle No. 105—Page 267

V-BELT RATING GUIDE: Allis-Chalmers Mfg. Co., General Machinery Division, Milwaukee 1—Information in condensed form, including formulas, providing necessary data on new method of calculating the horsepower capacity of V-belt drives is contained in bulletin 20B6956B.
For More Details Circle No. 106—Page 267

CRANE CABS: Lintern Corp., Route 20, East, Painesville, O.—Successful air conditioning of crane cabs is discussed in bulletin AC 544 with description and application chart of company's equipment designed for this operation.
For More Details Circle No. 107—Page 267

METAL CHAIN: Chain Belt Co., Dept. PR, Milwaukee 1—Bulletin 53-56 contains data on special heat-treated, alloyed ferrous metal chain reported to be considerably harder than malleable iron, unusually ductile, readily machinable, and resistant to corrosion and abrasion.
For More Details Circle No. 108—Page 267

TEMPERATURE CONTROLLER: Minneapolis-Honeywell Regulator Co., Industrial Division, Wayne & Windrim Aves., Philadelphia 44—Complete specifications, prices, and application information on a new electronic temperature controller with range extended to cover −100 to +600° F are found in bulletin P-811.
For More Details Circle No. 109—Page 267

METAL POLE LIGHTS: Thompson Electric Co., 1173 Power Ave., Cleveland 14—Catalog PB-53 contains general information and detailed specifications on metal pole units designed to permit safe, efficient ground-level luminaire servicing. Variety of adapters and accessories for use with these units also are described.
For More Details Circle No. 110—Page 267

HIGH-PURITY ALLOY: Plastic Metals Division, National Radiator Co., Johnstown, Pa.—Technical data sheet PMS-24 gives analysis and prices of a typically 99.84 per cent pure electrolytic iron melting stock. Manufacturer recommends the alloy

FOREIGN READERS

The attention of our readers in foreign countries is directed to FOUNDRY's new method of handling requests for literature and product descriptions in this and subsequent issues.

All descriptions of new equipment and supplies and reviews of product literature now carry the complete address of the respective companies offering the equipment, supplies or literature. Complete addresses are given to facilitate foreign readers writing direct to these companies. It will no longer be possible for us to process foreign inquiries received on the business reply postal cards included on our "For Further Information" and "Ideas for Foundrymen" inserts.

We believe our foreign readers will find that they receive an earlier and more adequate response if they will write direct to the manufacturer. FOUNDRY will still be happy to supply foreign readers with reprints of what editorial material is available as described in our "Ideas for Foundrymen" section.

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for production and research projects in metallurgy and electronics. It is used also for the production of wire and plate where magnetic and electronic qualities are required and can be used in vacuum melting processes for production of high-purity iron parts. Small sample is attached to the data sheet.

For More Details Circle No. 111—Page 267

ALLOY CASTINGS: Cooper Alloy Foundry Co., Hillside, N. J.—Booklet CC54 pictorially shows the production stages in meeting demands for more than 3 million stainless steel spun rings per year, as well as various specialty aircraft castings produced in sand molds, permanent molds and shell molds.

For More Details Circle No. 112—Page 267

AIR CHECK VALVE: Pennsylvania Pump & Compressor Co., Bushkill Blvd., Easton, Pa.—Discharge line check valve which also can serve as a pulse-damper in air and gas compressors and which employs ring plate design valves to prevent reverse-flow is described in bulletin 509-D.

For More Details Circle No. 113—Page 267

STEEL PLANT: Delaware Steel Fabricating Corp., Foot of Madison St., Wilmington 99, Del.—Brochure shows fabricating facilities and representative products of structural steel and plate work, expansion joints and panels, dampers, flues, ducts and others manufactured by the company.

For More Details Circle No. 114—Page 267

BUYER'S GUIDE: General Electric Co., Schenectady 5, N. Y.—Data on hook-on wattmeters and ammeters, portable recorders, phase-sequence indicators, hand pyrometers, surface roughness scales and many other electrical instruments are found in buyer's guide GEA-5496B.

For More Details Circle No. 115—Page 267

CENTRALIZED LUBRICATION: Farval Corp., 3293 East 80th St., Cleveland 4—Case histories of installations of company's centralized lubrication systems are used to verify claims of savings in time, men, power, bearings and lubricants.

For More Details Circle No. 116—Page 267

VERTICAL MILLER: Duff Machine Co., 31 Wingate St., Haverhill, Mass.—Brochure offers detailed information and specifications of vertical milling machine that uses universal milling head.

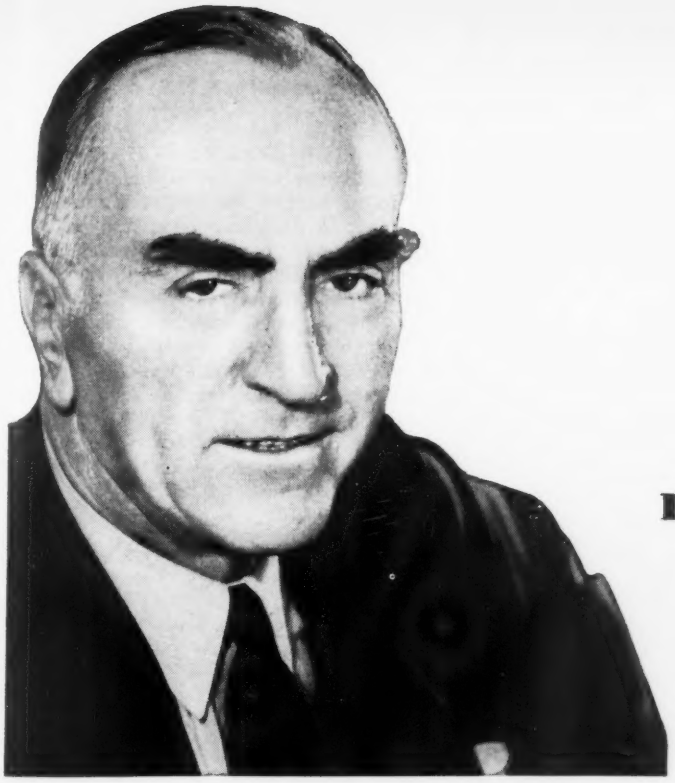
For More Details Circle No. 117—Page 267

FLUORESCENT LAMPS: Lustra Corp of America, 36 Washington St., Brooklyn 1, N. Y.—Form 1-166S contains illustrations, information and applications about nine shades of fluorescent lamps.

For More Details Circle No. 118—Page 267

TOOL LIMIT SWITCHES: Square D Co., Industrial Controller Division, 4041 North Richards St., Milwaukee 12—Service bulletin provides photographs, partial assembly sketches,

(*Continued on page* 304)



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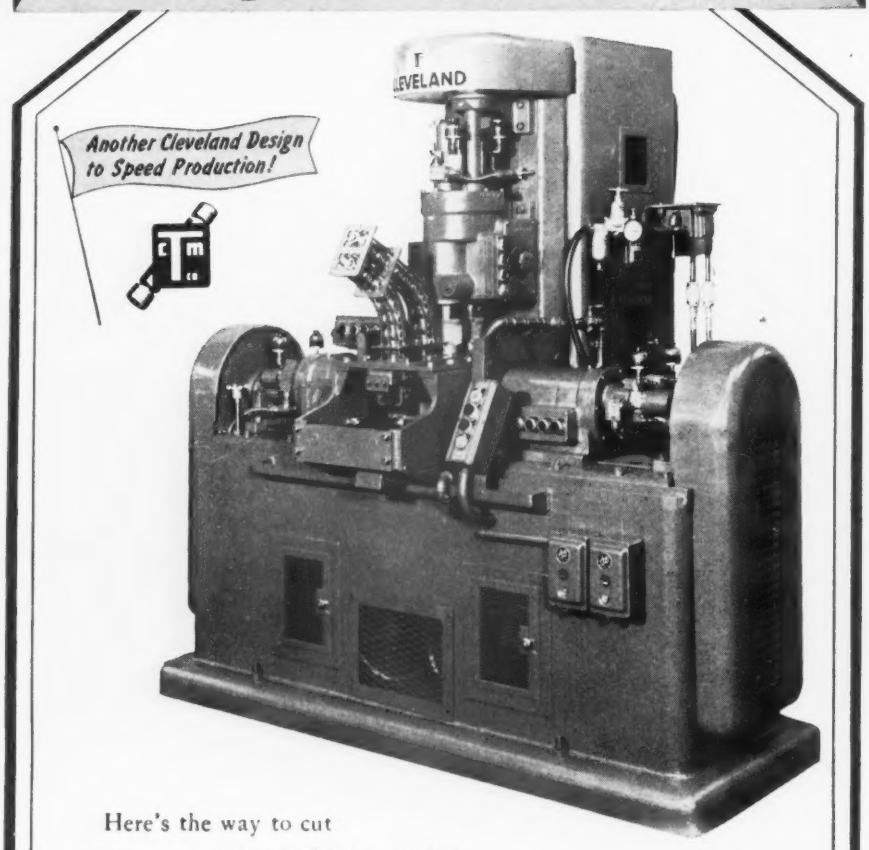

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CLEVELAND lead **fittings machines** screw

(*Continued from page* 302)

specification and dimension charts and operating sequence selection tables of some of the company's machine tool limit switches.

For More Details Circle No. 119—Page 267

MOTOR FRAME CHART: Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland 10—Chart is designed as an aid to compare quickly old and new FEMA alternating current motor frame assignment numbers. Chart shows, at a glance, comparative dimensions of open type and fan-cooled type polyphase induction motors. Sub charts compare frame sizes according to horsepower and speed. Chart is printed on one side only and is punched for insertion in looseleaf binders.

For More Details Circle No. 120—Page 267

HANDLING EQUIPMENT: Palmer-Shile Co., 16033 Fullerton Ave., Detroit 27—Company's revised 48-page catalog offers information on all types of materials handling equipment for pickup, loading, moving, dumping or storage. Several new products are described, including steel boxes with lap joints, a stand and reel for handling steel coils, a nesting stacking box, and a skid box with a side door which provides easy access to materials without removing stacked boxes.

For More Details Circle No. 121—Page 267

ELECTRIC OVENS: Claude S. Gordon Co., Industrial Furnace & Oven Division, 3000 South Wallace St., Chicago 16—Bulletin 1153 contains construction details, size and specification charts, photographs and other pertinent data on four electric ovens, a muffle furnace and a utility water swirl bath.

For More Details Circle No. 122—Page 267

ROOF REPAIR: Colonial Refining & Chemical Co., National Broadcasting Co. Bldg., Cleveland 14—Illustrated, simplified brochure for all types of roof repair tells how paper, metal, gravel and concrete roofs can be renewed and waterproofed with new process that can be handled by any plant maintenance crew.

For More Details Circle No. 123—Page 267

TROLLEY LADLES: Industrial Equipment Co., Minster, O.—Illustrated form provides information and specifications on line of taper side trolley ladles with universal square bails and worm gearing for safety pouring control.

For More Details Circle No. 124—Page 267

DUST COLLECTOR: Aget-Detroit Co., Ann Arbor, Mich.—Collection of cast iron dust, reputedly difficult to control, is the subject of bulletin 640 No. 1. It briefly analyzes the prob-

lem, relates the steps taken in selecting and installing the equipment and gives the cost of installation.

For More Details Circle No. 125—Page 267

TEMPERATURE INDICATORS: Foxboro Co., Foxboro, Mass.—Bulletin A-303-1 describes in detail the operating adjustments, features, test circuits, measuring elements and specifications of two portable temperature indicators, a potentiometer and a resistance thermometer. Instruments are used by industry for periodic temperature tests to spot impending troubles in equipment such as heating units and test furnaces, which may not warrant continuous measurement.

For More Details Circle No. 126—Page 267

ABRASIVE PRODUCTS: Carborundum Co., Niagara Falls, N. Y.—Booklet entitled "Abrasive Products for the Foundry" concerns abrasive products and their use in the foundry industry. High and low speed grinders, disc wheels, mounted wheels and points and abrasive products for the coreroom are discussed. Wheel recommendations for specific grinding operations also are given.

For More Details Circle No. 127—Page 267

HANDLING SYSTEM: Big Joe Mfg. Co., 900 West Jackson Blvd., Chicago 7—Pocket guide book, "In Between Handling—The Economical System for Handling Materials," covers the short distance hydraulic manipulation of materials too heavy for manual handling yet not requiring motor driven equipment. The booklet can serve as a reference source for measures which can be applied to your own plant and problems to help reduce overhead plant operations costs.

For More Details Circle No. 128—Page 267

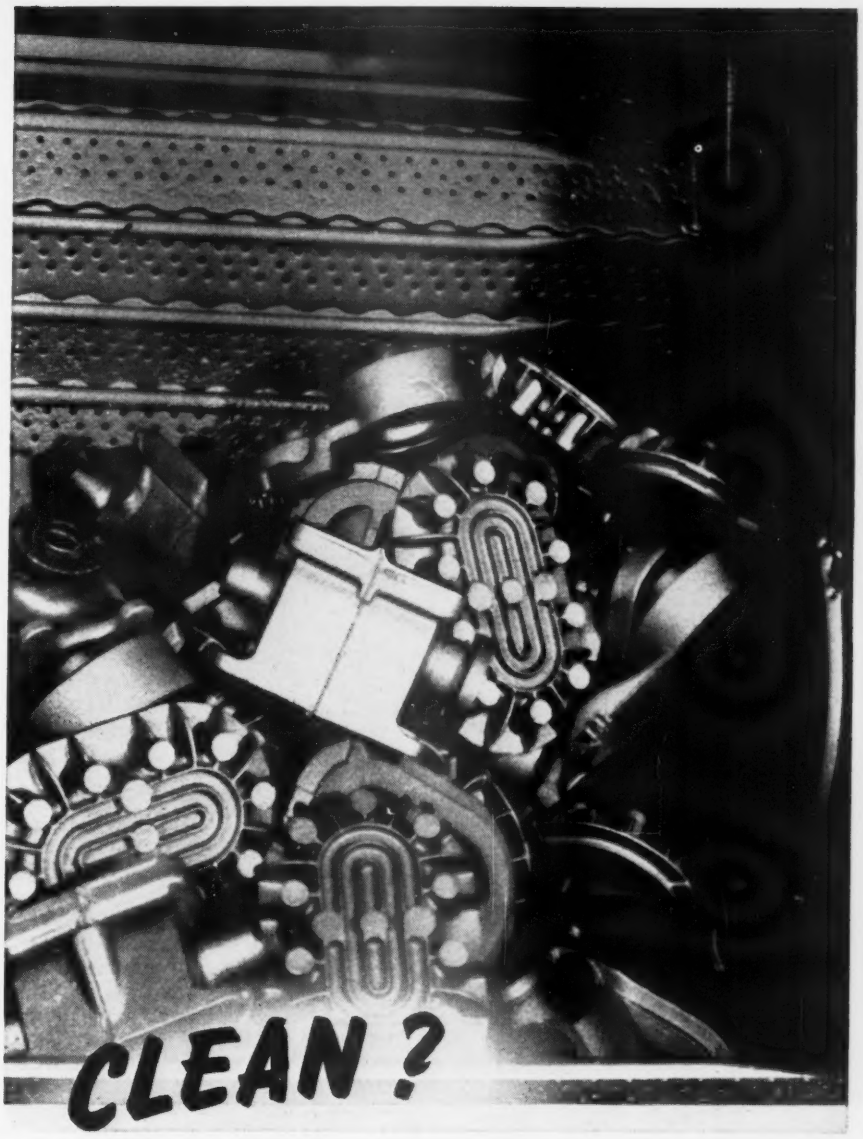
RUST PREVENTIVES: Rust-Oleum Corp., 2799 Oakton St., Evanston, Ill.—General catalog contains treatise on rust prevention and features 94 color chips of the company's products with complete instructions for surface preparation and application of primers, oils, sealers, thinners, finishes and other coatings.

For More Details Circle No. 129—Page 267

MOISTURE METER: Heyl & Patterson Inc., 55 Water St., Pittsburgh 22—Brochure describes moisture meter claimed to determine accurately the surface moisture in any powdered, granulated or fibrous material that does not react with calcium carbide.

For More Details Circle No. 130—Page 267

WATER SPRAY NOZZLES: Deister Concentrator Co., 905 Glasgow Ave., Ft. Wayne, Ind.—Simple spray nozzle reportedly is nonclogging, has



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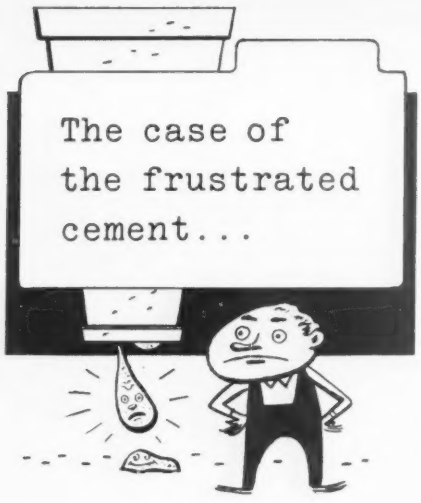
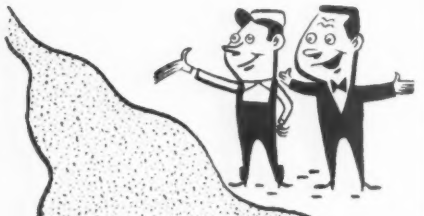


In a Chicago cement block plant a short time ago, production was really at a standstill. Try as it would, the frustrated cement just trickled through the hoppers and bins instead of flowing along steadily.

But a CLEVELAND vibrator solved the problem. In short order the trickle of cement increased to a flood.



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no threads at joint, makes up tightly, is easily removed and quickly replaced. Orifice data and installation notes are included.
For More Details Circle No. 131—Page 267

HEAT TREAT FURNACES: R-S Furnace Corp., Division of Hardinge Co., 240 Arch St., York, Pa.—Descriptions and applications of car hearth, rotary hearth, pit, roller hearth, belt, chain, and pusher type heat treating furnaces are contained in bulletin 200. Data on a furnace with circular chamber suitable for continuous handling of straight stock such as bars, pipe, tubing and slabs regardless of length also is included.
For More Details Circle No. 132—Page 267

SAND MULLERS: Beardsley & Piper, Division of Pettibone Mulliken Corp., 2424 North Cicero St., Chicago 39—Bulletin illustrates and describes six redesigned sand mullers with various capacities from 6½ to 76 tons per hour. The redesigned units are claimed to make possible development of maximum physical properties of most molding and core sands in 45 to 90 seconds. The mullers utilize centrifugal force transmitted through horizontally mounted, rubber-tired wheels into high-pressure squeezing and kneading action. This action, combined with agitation during mulling, is said to accomplish rapid distribution of water and other additives. Sand is turned over about 200 times a minute.

For More Details Circle No. 133—Page 267

HYDRAULIC CYLINDERS: Petch Mfg. Co., 463 York, Detroit 2—Loose-leaf catalog gives specifications and engineering data regarding air and both high and low pressure hydraulic cylinders. The air and low pressure cylinders range in size from 1½ to 10 in. bore and the high pressure hydraulic cylinders from 1½ to 6 in.
For More Details Circle No. 134—Page 267

FLEXIBLE METAL HOSE: DK Mfg. Co., Cobra Metal Hose Division, 4640 West 64th St., Chicago 32—Catalog 100 presents application data and specifications on a wide range of seamless thinwall metal hose in stainless steel, bronze, monel, nickel and steel designed for use in high-temperature, high-pressure and highly corrosive conditions.
For More Details Circle No. 135—Page 267

CRANES: Abell-Howe Co., 53 West Jackson Blvd., Chicago 4—Series of industrial shop cranes in four models to suit varying headroom and building conditions is described in bulletin 6-B. Cranes are available in capacities up to 15 tons; spans to 60 ft. Fluid drive can be had as optional equipment.
For More Details Circle No. 136—Page 267

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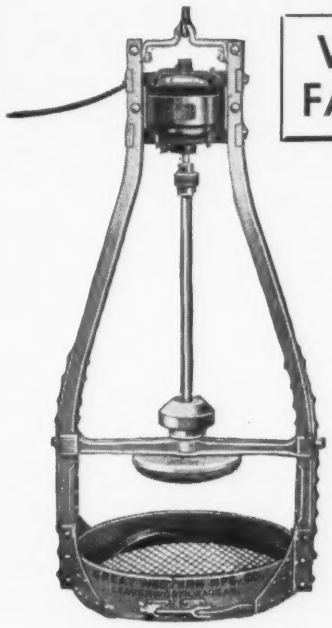

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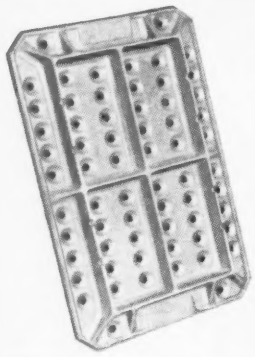

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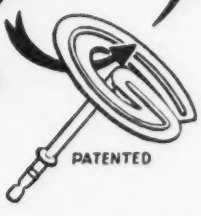

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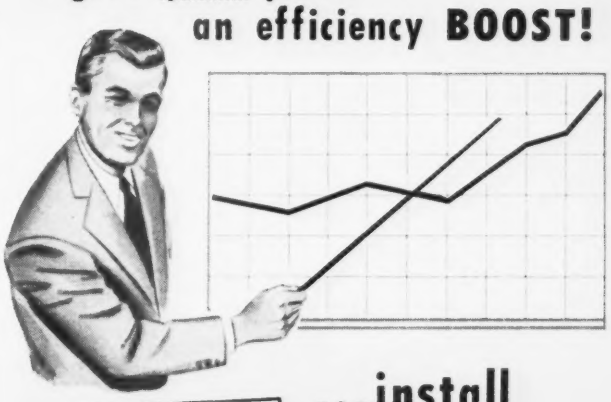

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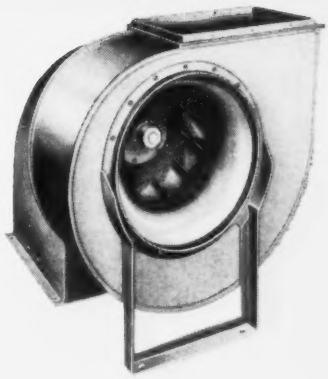

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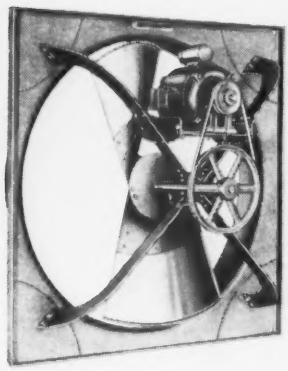

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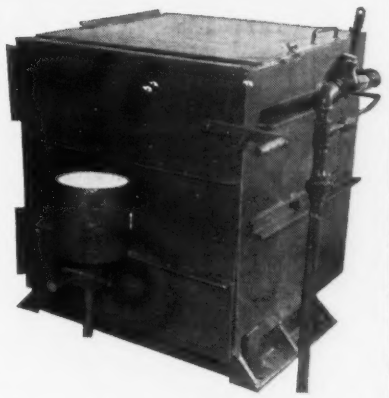

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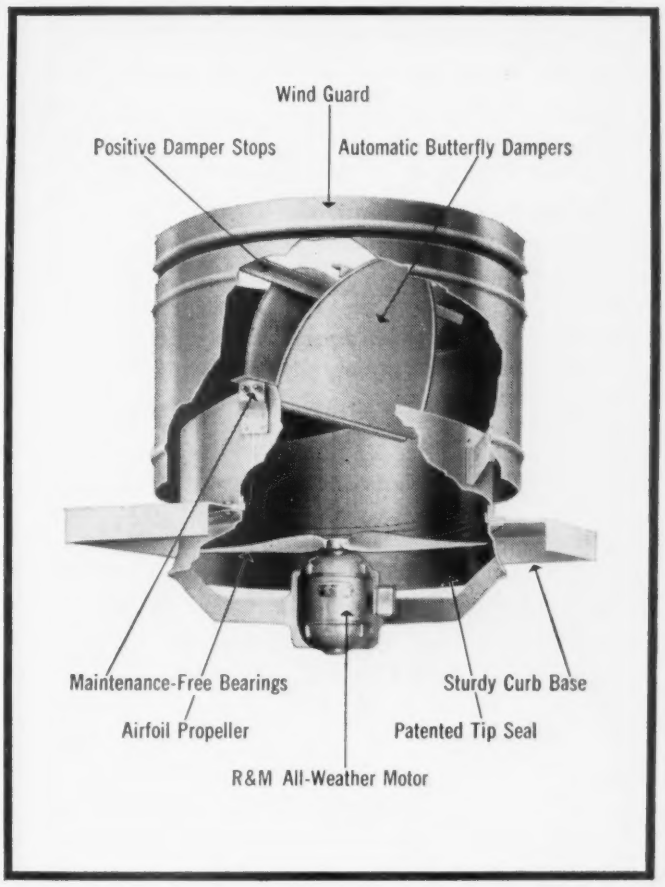

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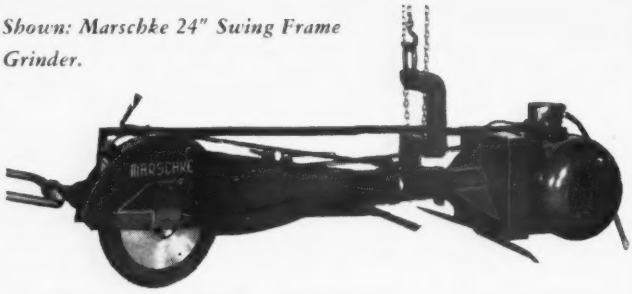

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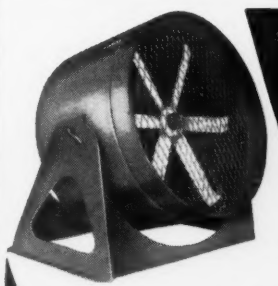

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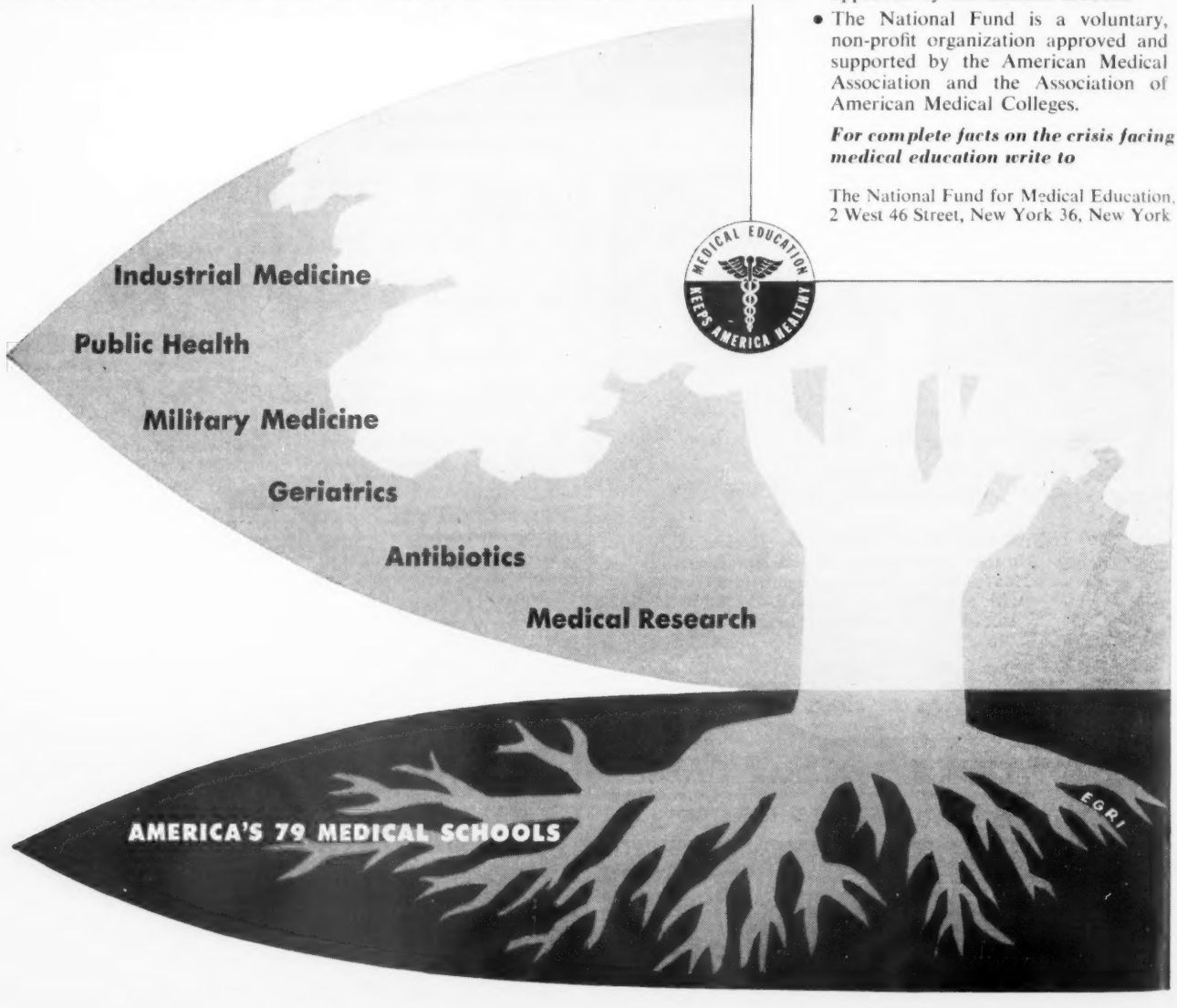

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To help foundrymen minimize and eliminate defective castings. Thirty-one basic casting defects are listed and described. Defects are defined simply and completely, illustrated by 101 figures collected from foundries of the United States and Canada.

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Book Department
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PneuBin saved $24,000.00 per year on a total investment of $1460!

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"... we wish to advise you that we have benefited by the installation of the PneuBin, not only through savings in labor and material, but more important by uninterrupted production, for which we estimate at a total of $2,000.00 monthly savings. In view of the excellent results, we have recommended the PneuBin to our Central Engineering Department for installation wherever similar difficulties are encountered."

*Complete letter on request.

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Take a tip from this company who has solved its flow stoppage problems with PneuBin. Let a PneuBin engineer show you how your company can effect big savings by decreasing your material flow problems.

PneuBin is designed to alleviate flow stoppage problems in your bins through the principle of "positive displacement." PneuBin moves the bin contents . . . not the bin. PneuBin neoprene panels, mounted on the inside walls of the bin, operating off the plant air supply, will eliminate rat holing, bridging, caking or high-viscosity hang-up.

SIZES: PneuBin panels are available in 14 standard sizes, 4" to 24" wide, 6" to 72" long. Special sizes can be made if required in quantity.

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- ✓ Does *not* affect permeability of shells.
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- ✓ Completely stable at all molding temperatures.

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Sample Can	$ 2.00
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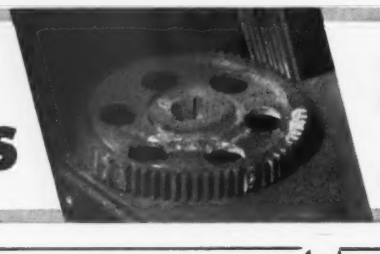

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Cast or Malleable Iron Machineable . . . without Preheating

Worth its weight in gold for repairing defective castings, castings sand pockets, machining errors, etc.

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Careful balancing makes Penn Buckets self dumping when loaded and self righting when empty. Welded construction prevents "clinging" makes them empty easily and completely.

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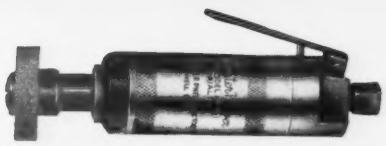
Master Power
HARD CHROMED • PORTABLE PNEUMATIC TOOLS



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Wins satisfied users year after year because (1) It eliminates costly waiting for pattern equipment! (2) Your own molder can make your own cope and drag patterns or match plates right in your own foundry! No special experience needed! (3) You get longer runs with Tamastone . . . thousands of molds from every pattern. (4) No job too big! (5) No run too small or complicated! . . . That's for sure . . . You're sure to like TAMASTONE!

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CLASSIFIED ADVERTISING

Help Wanted

ASSISTANT PATTERN SHOP SUPERINTENDENT

Experience in steel foundry practice desirable. In replying give complete information which will be held in strict confidence by a single executive.

BOX 133

FOUNDRY CLEVELAND 13, OHIO

FOUNDRY SUPERINTENDENT

For progressive jobbing gray iron foundry. Must be versed in slinger, bench and squeezer molding. Position presents sound opportunity for aggressive, practical foundryman with salary and bonus arrangement. In application please present complete abstract, and compensation expected. Address: Box 183, FOUNDRY, Cleveland 13, Ohio.

ASSISTANT MANAGER

British born Assistant Foundry Manager required for iron, steel and bronze foundry in Canada (Ontario). Reply giving full details of previous experience and salary required. Address: Box 201, FOUNDRY, Cleveland 13, Ohio.

Help Wanted

SUPERINTENDENT

Well-established malleable foundry offers excellent opportunity for qualified superintendent. Knowledge of mechanized operations desired. Give age, experience and salary data.

BOX 132

FOUNDRY CLEVELAND 13, OHIO

GRAY IRON FOUNDRY SUPERINTENDENT

We are looking for a foundry superintendent that has practical experience in squeezer, floor molding, core making, rigging, and cupola practice and is also able to read blueprints and estimate weights. If you are able to qualify as mentioned, there is an excellent opportunity waiting for you in a modern, clean foundry that employs approximately sixty (60) employees near Chicago, Illinois. Please give age, references, and wages expected. Address: Box 203, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY FOREMAN

To take charge of molding machine production in progressive New England foundry. Require steel or alloy steel foundry experience in semi-production or jobbing shop. Excellent opportunity for right man. Write full details of experience and personal background and salary expected. All replies confidential.

BOX 148

FOUNDRY CLEVELAND 13, OHIO

Help Wanted

CUSTOMER CONTACT INSPECTION SUPERVISOR

FOR

LARGE PRODUCTION MECHANIZED FOUNDRY IN THE MIDWEST

Great Opportunity For The Future For a Man Willing To Work In A Rapidly Expanding Organization

Must Have Ability To Meet People And Be Able To Travel Part Time

Experience In Inspection, Pattern Work Or Engineering Would Qualify

Write Stating Age, Personal Background And Past Experience

BOX 205

FOUNDRY CLEVELAND 13, OHIO

FOREMAN WANTED

Gray iron foundry, pouring 5 tons a day. North Central Pennsylvania—salary and bonus. Send full particulars in letter.

BILLARD MACHINE & TOOL CO.
MANSFIELD, PENNSYLVANIA

REFRACTORY SALES ENGINEER

For compact East coast distributor's territory Must be experienced, preferably with boiler setters and smaller metals plants. Address: Box 204, FOUNDRY, Cleveland 13, Ohio.

Help Wanted

METALLURGIST OR TECHNICIAN

Malleable foundry, Chicago area, wants experienced man to assist chief metallurgist in supervision of duplex melting, sand control, investigation of new developments, etc. Annealing experience helpful but not vital.

BOX 199
FOUNDRY CLEVELAND 13, OHIO

PERMANENT MOLD DESIGNER

Must be experienced. State qualifications and salary expected.

BOX 198
FOUNDRY CLEVELAND 13, OHIO

WANTED

Man thoroughly familiar with cupola operation and maintenance for sales position. Travel several midwestern states. Give age, experience and salary expected.

BOX 195
FOUNDRY CLEVELAND 13, OHIO

WANTED

Method and Time Study Engineer.
Relocate Middlewest.
Gray iron foundry experience required.
Jobbing shop.

BOX 192
FOUNDRY CLEVELAND 13, OHIO

SALES-ENGINEER

National organization desires to permanently employ a sales-engineer to be responsible for sales of bonding clay to foundries throughout the United States. Must be qualified to deal with customer technical personnel and buyers. Sand conditioning control knowledge beneficial. Salary plus expenses open. State qualifications in detail. Our personnel know of this ad and all replies will be kept confidential. Address: Box 193, FOUNDRY, Cleveland 13, Ohio.

MANAGER

For small aluminum and bronze jobbing foundry currently expanding. Because of ill health must replace manager. Must know all phases of sand molding, floor, bench, and squeeze work. Also rigging up jobs, able to read blue prints and estimate cost of castings from print. This is a splendid opportunity for the right person. Address: Box 190, FOUNDRY, Cleveland 13, Ohio.

METALLURGIST WANTED

For steel jobbing foundry producing miscellaneous carbon steel, low and high alloy steel castings. State qualifications, experience and salary. Address: Box 209, FOUNDRY, Cleveland 13, Ohio.

IF YOU HAVEN'T FOUND JUST THE RIGHT JOB TO SUIT YOUR TALENTS LISTED IN THE ABOVE ADS, FOR A NOMINAL CHARGE YOUR AD CAN BE BROUGHT TO THE ATTENTION OF FOUNDRY EXECUTIVES EVERYWHERE.

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WRITE

FOUNDRY

CLASSIFIED ADVERTISING DEPT.

PENTON BLDG., CLEVELAND 13, OHIO

Positions Wanted

SOUTH AMERICA

Foundry superintendent at present in charge of machine shop and gray iron foundry of a chemical company, desire to relocate in South America. Experienced also in steel, malleable, nonferrous foundries. Willing to take major part of salary in currency of the country located. Speak Portuguese and Spanish. Age: 40 years. Technical education. Address: Box 189, FOUNDRY, Cleveland 13, Ohio.

MANAGER OR SUPERINTENDENT

Thirty-five years' practical experience in foundry—molder 18 years, have been foreman, superintendent and general manager. Did consultation work in various foundries. One was losing $7,000 per month when I started, in seven months it was making good money. If you are in trouble I am the man you need. At present general manager of small shop making gray iron, semi-steel, some brass and aluminum. Have been there twelve years. Desire a change; available immediately. Best of references. Address: Box 177, FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT

Or assistant superintendent for aluminum permanent mold foundry. Background—practical foundry and finishing department experience, methods, can install incentive system, cost reduction. Address: Box 187, FOUNDRY, Cleveland 13, Ohio.

GENERAL MANAGER

Mature, profit-minded, dependable. Have successfully managed four companies—two taken out of the red. Available for service shortly with medium-size company requiring reliable directing ability in management, sales, finance and production. Excellent experience, foundry machine and related lines. Address: Box 215, FOUNDRY, Cleveland 13, Ohio.

FOUNDRYMAN

Superintendent or general foreman. Practical man, experience in aluminum and gray iron, jobbing and production. Well versed in all phases of foundry work. Married, age 45. Address: Box 160, FOUNDRY, Cleveland 13, Ohio.

MASTER MECHANIC

Experienced in all phases of machine shop work, plant and equipment maintenance, have successfully developed preventive maintenance programs. Ability to handle men, over ten years' supervisory background. Married, age 37. Address: Box 180, FOUNDRY, Cleveland 13, Ohio.

FOUNDRYMAN

Gray iron foundryman, thirty-four years' experience, seventeen years in supervisory capacity from foreman to superintendent. Broad experience in jobbing and diesel work, light and heavy, green and dry sand. Well versed in gray iron metallurgy, sand control, melting alloy irons in cupola and electric. Practical experience in molding, core making and cleaning. Supervisory experience in production, costs, quality control and labor relations. Married, age 53. Good references. Address: Box 146, FOUNDRY, Cleveland 13, Ohio.

GRAY IRON FOUNDRY EXECUTIVE

Well versed in all phases of foundry procedures available. Molding, light and heavy. Green and dry sand. Coremaking, cupola operation, gray iron metallurgy, foundry costs, customers contacts. Thirty years foundry executive experience various capacities. Presently employed. Address: Box 218, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY EXECUTIVE

Young executive with 19 years in gray iron foundry. Wide experience in personnel, wage and salary incentives, timestudy, job and merit rating, standards, labor control. All phases of industrial relations and industrial engineering. Age 39. Desire new connection in foundry industry. Address: Box 194, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY METALLURGIST SUPERVISOR

Degree in metallurgy plus a four-year foundry apprenticeship. Considerable experience dealing with nonferrous foundry problems and some supervision. Desire position in a technical or supervisory capacity. Age 30. Address: Box 222, FOUNDRY, Cleveland 13, Ohio.

INDUSTRIAL ENGINEER

Graduate Engineer, sixteen years foundry experience in methods, materials handling, application of standard data, incentives and personnel relations, for mechanized and non-mechanized foundries. Address: Box 206, FOUNDRY, Cleveland 13, Ohio.

CLASSIFIED ADVERTISING

Positions Wanted

EXPERIENCED YOUNG FOUNDRYMAN

Twenty-one years of practical experience with aluminum, magnesium, bronze, stainless and carbon steels and Ni-Resist castings. Qualified as foundry foreman, assistant superintendent and process engineer. Can handle rigging, gating and risering of production patterns, sand and shell molding, metal patternmaking, molding machine operation, melting, maintenance, and all other phases of foundry operation. Can organize and handle men and increase production. Would take good job offer or partnership anywhere in USA or Canada. Best references. Now employed, married, 38. Address: Box 191, FOUNDRY, Cleveland 13, Ohio.

WEIGHT ESTIMATING

Estimating of casting weights furnished by return mail. Accurate, reliable and confidential service. Automatic calculator equipment. Nominal fee. Send blueprints to: CHARLES E. ROLAND, ITASCA, ILLINOIS.

SUPERINTENDENT OR GENERAL MANAGER

If your scrap is high and your costs are up I can help you. Have always been able to get a foundry out of trouble and make a profit for the company. That is why I can make this statement. Results guaranteed or no cost to you. Have 26 years' of practical experience in all phases of foundry operation; 45 years old. Can furnish references and any other information requested. Address: Box 134, FOUNDRY, Cleveland 13, Ohio.

STEEL FOUNDRYMAN

Foundry superintendent or general foreman. Twenty-six years in steel and high alloy foundries. Able to handle men and labor relations. Address: Box 196, FOUNDRY, Cleveland 13, Ohio.

ELECTRIC MELTER AVAILABLE

Eighteen years' experience, basic and acid. Capable supervisor. Quality steel guaranteed. Excellent references. Will relocate. Address: Box 223, FOUNDRY, Cleveland 13, Ohio.

TIME STUDY ENGINEER

Eighteen years in foundry; eight on time study. Experienced on all types of molding, coremaking, grinding, chipping. Supervisory experience on time study and payroll. Graduate of University of Pennsylvania Extension School. Age 35, married. Address: Box 212, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY FOREMAN

Desire position in foundry of about 25 to 30 molders. Wide practical experience on light and medium sand castings. Well versed in cupola operation. Middle aged. Address: Box 211, FOUNDRY, Cleveland 13, Ohio.

SHELL MOLD ENGINEER

Industrial engineer foundryman wants shell mold position. Experienced in pilot operations and equipment design. Address: Box 210, FOUNDRY, Cleveland 13, Ohio.

EXECUTIVE

Experienced in all phases of foundry operation and management with thorough knowledge of each shop process, engineering, metallurgy, cost estimating and accounting, sales and industrial relations. Technical graduate. Excellent recommendations. Address: Box 100, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY EXECUTIVE

Thoroughly experienced in the management of gray iron production or jobbing foundries. Qualified to show you a highly efficient and low cost operation. If you are interested. Address: Box 214, FOUNDRY, Cleveland 13, Ohio.

MECHANICAL ENGINEER

Experienced in mechanized high production foundry. Machine tool background. Age 35. Desire position as plant engineer. Address: Box 208, FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

FOUNDRYMAN—IRON OR STEEL

Looking for a good place to work. Fifteen years in supervisory experience covering all phases of foundry activities with particular emphasis on cupola and electric furnace melting, metallurgical and sand controls, heat treating, inspection, sales, and customer correspondence. College background. Age 39, located in midwest. Will go anywhere. Address: Box 207, FOUNDRY, Cleveland 13, Ohio.

CORE ROOM SUPERVISOR

Chicago area only. All phases in core blowing, large and small cores. Bench and rollover experience, sand control, ferrous and nonferrous, dry sand molding. Address: Box 188, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Twenty-five years' experience, from the cupola to the finished casting. Light, medium and heavy castings, from gray iron to high tensile close grain iron, jobbing and production. Address: Box 219, FOUNDRY, Cleveland 13, Ohio.

CHIEF INSPECTOR

Seventeen years' experience steel, gray iron, malleable. Capable of developing inspection department, contacting customers, also consider receiving inspection. Address: Box 217, FOUNDRY, Cleveland 13, Ohio.

SALES OR ADMINISTRATION

College graduate, business administration. Apprentice school graduate (foundry practice) with five years practical foundry experience. Desire position in sales or administration. Address: Box 220, FOUNDRY, Cleveland 13, Ohio.

MANAGER OR SUPERINTENDENT

Capable executive, 25 years' experience in heavy jobbing and light production operations. Practical and technical experience. Progressive and cost minded. Age 44. Address: Box 213, FOUNDRY, Cleveland 13, Ohio.

FOUNDRYMAN

Superintendent or general foreman. Practical man. Twenty-seven years' experience in gray iron and nonferrous jobbing and high production shops. Now employed. Western or central New York preferred but not essential. Address: Box 216, FOUNDRY, Cleveland 13, Ohio.

Representatives Wanted

SALES REPRESENTATIVES

To handle well-established line Corn Cereal Binders. Open territories available at Birmingham, Buffalo, Cincinnati, Cleveland, Houston, Indianapolis, Minneapolis, San Francisco and Seattle. Address: Box 173, FOUNDRY, Cleveland 13, Ohio.

METALS, MINERALS, CHEMICALS

Salesman, with industrial clientele, wanted on high commission. Write complete personal and sales data in confidence. Include photo. **BRAM CHEMICAL CO., 820-65th AVE., PHILADELPHIA 26, PENNSYLVANIA.**

Accounts Wanted

ACCOUNTS WANTED

A Canadian Company of international repute offering specialized foundry supplies, with offices, warehouse and factory in Ontario and with technical representatives calling regularly on foundries throughout Canada, seeks sole agencies and selling rights in Canada for U. S. products which are essentially for application in the foundry trade. Address: Box 197, FOUNDRY, Cleveland 13, Ohio.

Engineering Service

FOUNDRY TECHNICAL SERVICE
FOR
STEEL, MALLEABLE, AND GRAY IRON FOUNDRIES

The purpose of this Service is to establish sound, stable foundry practices in all production departments. To promote reduction in scrap and costs; to better quality of castings thereby giving improved service to the customers.

INQUIRIES ARE SOLICITED.
FOUNDRY ENGINEERING SERVICE
718 WEST SECOND STREET
MARION, INDIANA

Employment Service

FOUNDRY PERSONNEL SPECIALISTS
National Placement and Procurement of

GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS.

Confidential Inquiries Invited
From Employers and Qualified Applicants.

For Fast Competent Assistance Contact

JOHN COPE, DIRECTOR — **37 S. WABASH, CHICAGO 3, ILL.**
IMPERIAL PERSONNEL — **FRANKLIN 2-4233**

NEED CAR UNLOADERS?

Use Manpower, Inc. men to unload your cars of sand, coal and materials. Call MANPOWER, INC. in Milwaukee, Chicago, Cleveland, Cincinnati, St. Louis, Philadelphia, or write **MR. RICHMAN, MANPOWER, INC., 330 WEST KILBOURN AVE., MILWAUKEE 3, WISCONSIN.**

SALARIED PERSONNEL

$3,000-$25,000. This reliable service, established 1927, conducts confidential negotiations for high grade men who seek a change of connection under conditions assuring if employed full protection to present position. Send name and address only for details. Personal consultation invited. Address: **JIRA THAYER JENNINGS, 241 ORANGE STREET, NEW HAVEN 10, CONN.**

Representative Available

REPRESENTATIVE AVAILABLE

If you need proven sales ability in your sales department, a successful sales background in the foundry industry is available to you. At the age of 38, I desire a position as sales manager, or divisional sales representative. Write today and arrange for a personal interview. Address: Box 202, FOUNDRY, Cleveland 13, Ohio.

Opportunity

CANADIAN COMPANY

With foundry and machine shop facilities would like new lines to manufacture on royalty or other basis for Canadian market. Nonferrous preferred.

BOX 114
FOUNDRY — **CLEVELAND 13, OHIO**

OPPORTUNITY

Will invest nominal sum and services in an aluminum sand, shell molding, or permanent mold foundry. Well rounded experience. Address: Box 186, FOUNDRY, Cleveland 13, Ohio.

Wanted-To-Buy

WANTED
MAGNESIUM CHIPS

We pay top prices for Magnesium Chips, Borings, Cuttings, Shavings, etc.

STANDARD MAGNESIUM CORP.
7600 EAST 41st STREET
TULSA, OKLAHOMA

MACHINERY WANTED

Induction Furnaces, Screens, Simpson Mixers, Riehle Compression Testing Machines, Pulverizers, Grinders, Conveyors. Address: **CONDENSER SERVICE & ENGINEERING CO., INC., HOBOKEN, NEW JERSEY, BA 7-0600.**

Wanted-To-Buy

WANTED TO BUY

INDUCTION MELTING FURNACES

100# to 300# capacity
Contact us before selling.

UNIVERSAL MACHINERY & EQUIPMENT CO.
320 E. BROAD ST.
SHILLINGTON, PA.
PHONE: READING 7-1321

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price or immediate acceptance. Address Box 578, FOUNDRY, Cleveland 13, Ohio.

WANT TO BUY

Controlling interest in small or medium sized foundry by two graduate engineers, one sales and one shop experienced. Address: Box 185, FOUNDRY, Cleveland 13, Ohio.

WANT TO BUY

Or lease all or part of small electric furnace foundry making iron or steel castings. Address: Box 184, FOUNDRY, Cleveland 13, Ohio.

WANTED

Three inch and four inch soil pipe fitting patterns. Address: FLOYD GOLDEN, BRIGHTON, MICHIGAN.

Foundry Work Wanted

LOWEST COST

Top quality guaranteed. Foundry and machine shop work. Low taxes. Low wage scale. Send drawings for prompt low price quotation. Address: **AMERICAN FOUNDRY AND MACHINE SHOP, APARTADO 2610, MEXICO CITY, MEXICO.**

Foundries For Sale

FOUNDRY FOR SALE

Gray iron foundry and product. $200,000 a year volume. Selling price, $45,000. Central Pennsylvania.

BOX 221
FOUNDRY — **CLEVELAND 13, OHIO**

FOUNDRY FOR SALE

Small gray iron foundry in Southern state which leads the South in industrial expansion. Opportunity for one with "know how" and small capital to own profitable business. Address: Box 142, FOUNDRY, Cleveland 13, Ohio.

CLASSIFIED ADVERTISING

Foundries For Sale

FOUNDRY FOR SALE

GRAY IRON and nonferrous foundry producing castings up to 5 tons. Daily capacity 25 tons. Good highway and rail facilities. Eight acres. Small eastern town. Owner willing to stay as manager.

EDWARD H. ZOLL
FOUNDRIES SOLD AND LEASED
790 BROAD STREET NEWARK 2, N. J.

FOR SALE

Brick and steel foundry, Southern Illinois, 160 x 320 feet, overhead monorail, water transportation available. Ideal for mechanized operation, contains equipment. Address: Box 200, FOUNDRY, Cleveland 13, Ohio.

FOR SALE OR LEASE

Well equipped brass and aluminum foundry in central Indiana. Now operating. Address: Box 179, FOUNDRY, Cleveland 13, Ohio.

SHELL MOLDING PLANT FOR SALE

Complete with all parts, machine, hoppers, pouring cars, etc. at big reduction from original cost. Can be seen in use. Everything in fine condition. Address: FINLEY MACHINERY COMPANY, VALDOSTA, GEORGIA.

For Sale

ATTENTION:
PNEUMATIC TOOL USERS

200 never used tools and many hundreds of rebuilt Chippers, Rammers, Riveters, Grinders, etc. at substantial savings.

Very large stock of spare parts, Standard and O/S.

Complete repair service on your tools by refitting parts or rebuilt to original sizes with HARD CHROME.

30 years' experience handling all makes and models.

Send us your next tools as a trial. Satisfaction guaranteed or money refunded. Estimates furnished.

THE PNEUMATIC TOOL PRODUCTS CO.
1340 EAST 222nd ST.
EUCLID 17, OHIO
PHONE: KE 1-4990

FOR SALE

1 SUPER STATIONARY BEARDSLEY & PIPER SAND SLINGER

19" head
5" tip
16/26 Horse Power
220/440 volts
1180/1750 RPM
Serial No. S-554-515
Complete with 5 ton plate feeder

THIS MACHINE HAS HAD ONE MONTHS PRODUCTION TIME.

ELECTRIC STEEL FOUNDRY COMPANY
2141 NORTH WEST 25TH AVENUE
PORTLAND 10, OREGON

FOR SALE

Cupola—Whiting #8.
New 1950. Cost $8000.00
Sell for $2000.00. Used 100 hours.

JACK RODEGHIER
712 N. RAYNOR AVENUE
JOLIET, ILLINOIS

For Sale

FOR SALE

DIELECTRIC CORE OVENS—Model 900A and Model 1800A Conveyor type; Mfg. 1949 by Induction Heating Corp.

#91 Osborn Core Blower—for small cores

#193 Osborn Core Blower—for medium cores

#94 Osborn Core Blower—for large cores

15000 lb. Hyster Fork Truck

6000 lb. Clark Fork Lift Truck

Herman Jar rollover & Pattern Draw; 1944; 48" x 144" 10,000# series

International JDP Pattern Draw; 600 lb. cap.; 8" draw; on wheels

#2047-3 Osborn Jolt Rollover

#601-13 Osborn Jolt Rollover

#275J Osborn Jolt Squeezers

27" x 36" American Wheelabrator

8' Pangborn Tableblast

Chicago Pneumatic Air Compressor—220 H.P. Diesel Operated

#2 Climax Wire Straightener

Marschke Swing Frame Grinder—10 H.P.

#6 Whiting Cupola Blower

Beardsley & Piper Stationary Sandslinger; 19" head; 2 speed meter, 14' arm, 5 ton plate feeder; 6' belt unit

Beardsley & Piper Motive Type Sandslinger—19" head

Beardsley & Piper Model M Screenerator—1951

FOR THE BEST DEAL CALL

BALCHER MACHINERY COMPANY
6020 EUCLID AVENUE
CLEVELAND 3, OHIO
TEL: EXPRESS 1-6909

FOR SALE

Pangborn Rotoblast #14. Good condition. Complete with loading hopper, grit reclaiming unit. All motors and electrical controls. $1800 FOB Hackensack, New Jersey.

C. G. SINGLETON
76 BRIDGE STREET
HACKENSACK, N. J.
TEL: DI 3-5722

FURNACE TRANSFORMER

Kuhlman, 191 KVA, 2200 V Prim, 90 V Sec, 1 Phase, 60 Cycles, 2125 Amps, 40% Reactance. Slightly used. Good condition.

DELL STEPHENSON & COMPANY
14456 GLASTONBURY
DETROIT 23, MICHIGAN
VERMONT 5-0697

CARBON & GRAPHITE
Blocks—Plates—Rounds
MOTOR AND GENERATOR BRUSHES
of all types. Original equipment and repacement. Quick delivery from stock. Substantial savings.
BECKER BROS. CARBON CO.
BASIC MANUFACTURERS SINCE 1890.
3448 S. LARAMIE CICERO 50, ILLINOIS
BIshop 2-1260

For Sale

FOR SALE
TURBO BLOWERS WITH MOTORS

CFM	PRESS.	MAKE	CFM	PRESS.	MAKE
4500	16 oz.	G.E.	500	10 oz.	No.Am.
3500	40 oz.	Spencer	400	16 oz.	Spencer
2800	1 oz.	Spencer	400	4.3 oz.	Spencer
2700	16 oz.	Spencer	340	20 oz.	A-B
2500	7 oz.	Sturt.	320	12 oz.	Spencer
2000	2½ oz.	Spencer	225	16 oz.	Spencer
2000	1 oz.	Spencer	180	15 oz.	Spencer
1300	16 oz.	Spencer	110	16 oz.	Spencer
1150	20 oz.	No.Am.	2344	2" SP	Clarage
675	16 oz.	No.Am.	1100	4½" SP	Bayley
660	20 oz.	A-B			

THE MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVE.
CLEVELAND 14, OHIO

BUY—TRADE—SELL

48/42 Wheelabrator Rebuilt

27/36 Wheelabrator A-1 shape

8' Wheelabrator Table 7 spinner tables

3½ G.K.2 Pangborn Rocker Barrel, good condition

Dust Collectors, Hand Cabinets, Blowers, Vapor Blast Cabinet, Pressure Tanks.

If interested in trading your present equipment on any of the above, Call or Write:

DIAMOND SAND BLAST, INC.
5654 W. JEFFERSON AVENUE
DETROIT 9, MICHIGAN
VINEWOOD 3-6750

FOR SALE

Soil pipe equipment, to make 2" and 4" pipe. 100 shell fitting patterns, snap flasks and binders, 2", 3" and 4" core machine etc. at salvage price 5c per pound. Address: HERBERT J. BROWN, 2008 PORTLAND AVENUE, SHREVEPORT, LA.

FOR SALE

Floatex Shakeout, 48 x 72; B & P Mod. S; Portable Sand Conditioner; Pangborn GF2 Tumble Blast; many other items. Address: SOMIL EQUIPMENT & SUPPLY CO., 620 MARQUETTE AVE., SO. MILWAUKEE, WIS., PHONE: BR 1-7060.

FOR SALE

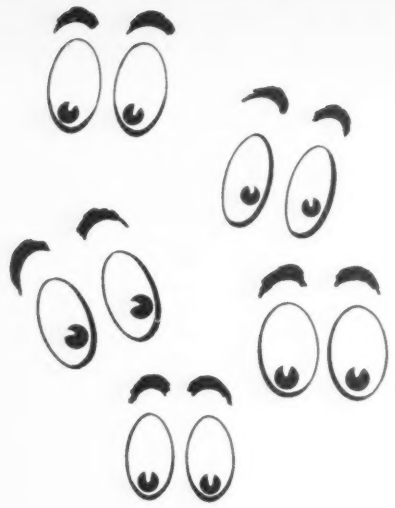
Assorted sizes of 5 degree taper diamond wood slip flasks. Like new. Price reasonable. Address: **COLUMBUS BRASS & ALUMINUM CO., INC., P. O. BOX 44, COLUMBUS, INDIANA.**

FOR SALE
DETROIT ELECTRIC FURNACE

Type AA of 1,200 lb. cold metal or 2,600 lb. hot metal capacity, complete with mechanical and electrical equipment for melting and rocking, including oil filled transformer of 11,000 v. primary and 125 v. secondary. Presently crated but available for inspection on 48 hours notice. Ideal for high test cast irons, brasses or bronzes. Price: $9,500.00. Address: **HOPE ELECTRICAL PRODUCTS CO., 338 WILSON AVENUE, NEWARK 5, N. J.**

FOR SALE

32" band saw; 275-gallon oil tank, 300 lb. aluminum furnace; oil pump and blower; furnace air vent. Make best offer. Address: MAGNIFLOOD INC., 38 NORTH SECOND AVE., MT. VERNON, N. Y., TEL: MT. VERNON 8-1385.



HAVE YOU EVER NOTICED the numerous types of headings under which classified ads are listed? Whether interested in obtaining qualified personnel, selling used machinery, wanting to buy equipment, or are yourself looking for a better position, you should seriously consider advertising in the classified section of FOUNDRY MAGAZINE.

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ADVERTISING DEPT.
FOUNDRY
CLEVELAND 13, OHIO

For Sale

FOR SALE

MOLDING MACHINES

1—Plain jolt machine, 60" x 72" table, 16" cylinder.
1—#276 PJ Osborn jolt squeezer.
2—No. 275 Osborn jolt squeezers.
2—Deuscher Stationary jolt squeeze.
2—SPO #611B Stationary Oscillating Jolt Squeeze Strippers.
1—#610 Johnston & Jennings Air Jolt Rollover Draw Portable 24 x 30 table.
1—Tabor 36 x 50 table Air Jolt Rollover Draw, 3000# capacity.
1—Tabor Pedestal Core Rollover Hand Ram Rollover Draw 14 x 20 table 8" draw.

BLOWERS FOR CUPOLAS AND FURNACES

2—15 HP Spencer-Turbine 2250 CFM at 16 oz.
2—#7½ Roots rotary blowers—27 x 81—14000 CFM.
1—Connersville rotary blower 22 x 66 45 cu. ft. per revolution 9000 CFM.

Maxon-Premix Blowers for Gas ¼ to 1 HP.
2—5 HP 20-oz. Spencer Turbine Blowers.
2—2 HP 20-oz. Spencer Turbine Blowers.

METAL MELTING EQUIPMENT

1—1000# open flame brass melting furnaces, gas fired.
1—MNP Fisher Tilting Al. Furnace 600# cap gas fired.
1—550# Reda Furnace, nonferrous or iron—oil or gas.
1—Hausfeld Stationary Brass, oil or gas burner, 200# cap.
1—Hausfeld Tilting crucible, gas, 250# Al Cap.
1—Hausfeld 2000# aluminum capacity furnace, barrel type, open flame, oil fired.

New 32" to 41" dia. shell cupolas made to order.
New 1000 lb. aluminum cap. tilting crucible furnaces to specifications.

MISCELLANEOUS

1—Ruemelin cabinet style sand blast room, 7' x 7' x 5' with pres. generator.
1—15 HP Gardner Denver air cooled compressor unit.
1—9 x 8 Ingersoll-Rand compressor, 173 CFM, 100 lbs. pressure, 25 HP.
1—Stoney crane type shakeout.
1—NC-4 Royer sand separator.
1—#1 Demmler core blower.
2—#16 Roto-clone units complete.
1—McLeod Small Sand Blast Barrel 24 x 24.
1—30 x 48 tumbling mill.
1—36 x 48 tumbling mill.

Complete stock of rebuilt mill and dust exhaust blowers.

CLIFTON MACHINERY COMPANY
1023 W. SIXTH ST. CINCINNATI 3, OHIO

FOR SALE

1—Tinius Olsen 100,000# Universal Compression Testing Machine
1—Magnaflux Demagnetizing Unit
Simpson Sand Mixers 18" dia. Laboratory #0, #1, #1½, #2, #3
Miscellaneous: Screens, Pulverizers, Grinders, Conveyors—all types, Tyler Rotap Screens, etc.
OUR 37TH YEAR

CONSOLIDATED PRODUCTS CO., INC.
66 BLOOMFIELD STREET
HOBOKEN, NEW JERSEY
HO 3-4425 N.Y. TEL. BA 7-0600

FOR SALE

Two Modern Equipment spark arrestors for 84" cupola. Never used. Address: **ALBION MALLEABLE IRON COMPANY, ALBION, MICHIGAN.**

FURNACES FOR SALE

Ten used heat treating furnaces and two 7-ton gantry cranes. Good condition, priced to sell. Address: **BAER STEEL PRODUCTS, INC., BOX 1428, BOISE, IDAHO.**

UNIVERSAL

FURNACES

1—350# **DETROIT** Arc Rocker
4—Large **HEAT TREAT** Furnaces
ARC MELTING FURNACES, 60# to 15 tons
3—**AJAX-TAMA-WYATT** 333 KW for Alum.

1,000 LB. MOORE SIZE S LECTROMELT—COMPLETE

5—**HAUSFELD TILTING,** various cap.
2—**FISHER TILTING,** 225 and 400# crucibles
5—**MONARCH** Barrel Type Tilting
1—**AJAX** 50 KW, 3000 cyc. MG

GUARANTEED EQUIPMENT

2—**WHITING #5 CUPOLAS** with Skip Charger and Spencer Turbo Blowers
1—**CHAMPION CORE BLOWER,** CB 400
1—**TROPENAS STEEL CONVERTER,** 2 Ton Side Blow, Complete with Blower

B & P STATIONARY SAND SLINGER 19" HEAD
B & P MOTIVE SAND SLINGER 19" HEAD

1—**B & P SPEEDMULLOR,** #60 with **SKIP**
1—**SIMPSON MULLER,** #3 with **SKIP**
2—**CLEARFIELD MIXERS,** #610 and #920
1—**WHEELABRATOR** 27 x 36" with **SKIP HOIST** and Dust Collector, Excellent Cond.
1—**AMERICAN SAND CUTTERS,** All Sizes
1—**HEWITT-ROBINS** Apron Type Conveyor
2—**SIMPLICITY SHAKE-OUTS,** 4' x 8'
9—**CORE OVENS,** gas & electric, all types
NUMBER OF MAGNETIC SEPARATORS
2—**BELL** Power Wheelbarrows, gas engines
1—**WHITING CUPOLA** #3½ with Skip Charger
1—**WHITING SKIP CHARGER** with Loader and 2,000 lb. **KRON** Scale
1—**WHITING #8A KATHABAR,** Cupola Hot Blast
10—**GRINDERS,** double end, 5 to 20 HP
1—**HOWE** electric **WEIGHOGRAPH** Scale
2,000 FT. Foundry Type **ROLLER CONVEYOR**
1—**LINK BELT REVIVIFIER**
1—40 HP Sullivan **AIR COMPRESSOR**
9—**SAND BELT CONVEYORS** 2—**ELEVATORS**
CENTRIFUGAL BLOWERS, 1 to 85 HP
1—**DEWALT ABRASIVE CUT-OFF,** 10 HP
ROYERS & SCREENERATORS, All Sizes

MOLDING MACHINES

1—**JOHNSTON & JENNINGS** 610 Rollover
2—**JOHNSTON & JENNINGS** #2 Jolt Squeeze Strippers
4—**OSBORN** #710 Jolt Strippers
1—**OSBORN** 444 Jolt Rollover
1—**DAVENPORT** 2SA Rollover

12 SPO 110J JOLT SQUEEZERS

1—**HERMAN ROLLOVERS,** 60 x 80, 40 x 60, 144 x 96

Over 50 others: **MILWAUKEE, INTERNATIONAL, TABOR,** All types and sizes, rebuilt and guaranteed

COMPLETE STOCK OF TESTING MACHINES, LAB EQUIPMENT, CORE BLOWERS, LADLES AND OVER 250 TONS OF STEEL FLASKS

Send for complete list of America's LARGEST STOCK of GUARANTEED EQUIPMENT

UNIVERSAL

MACHINERY AND EQUIPMENT CO.
320 E. BROAD ST.
SHILLINGTON, READING, PENNSYLVANIA
PHONE: READING 7-1321

ACME MAKES ANOTHER

Great Foundry Purchase!

We have purchased surplus machinery and equipment of the gray iron department of Western Foundry Co., Chicago.

A COMPLETE GRAY IRON FOUNDRY OFFERED FOR SALE PIECE BY PIECE.

Our agent on the premises 3634 South Kedzie Avenue weekdays Monday through Friday 8 to 5, Saturdays and holidays by appointment.

WE MUST CLEAR THE PREMISES!

3—Cupolas, Whiting #9, Whiting #7, Whiting #4.

Air Compressor, IR, 175 HP Synchronous Motor. Late. Also smaller sizes.

Blowers, several up to G.E. 7500 CFM, 20 oz. Air Way Controls, Roots-Connersville.

Bridge Cranes, Jib Cranes, Monorail

Core Blowers, Redford Bench type, Internation's SB13, Champion

Core Carts, Core Plates, Transite & Steel Core Racks, Wire Straighteners, Core Rollovers, Core Benches, Lightning Mixers.

Core Ovens, 2 Door Double end, car type Foundry Eq. Co. 5 Door Double end, car type Foundry Eq. Co.

Cupola Charger, Whiting Monorail type with buckets.

Grinders, bench, tool, carbide, double end snagging, swing frame, Besley 215 Disc, Gardner Flat Disc, wet grinder, knife grinders.

Hoists, Electric, hand, Ingersoll-Rand Pneumatic

4—Hough Payloaders

Laboratory, complete sand and metal testing equipment.

Ladles, covered cylindrical, mixing, tapered, all sizes up to 48 x 48. Modern pouring devices.

Lathes, Bardons & Oliver Turret, South Bend tool room Lift Trucks.

Milling Machine, Milwaukee 3 H, Ser. 50-5586, with Rosnok Vertical Head.

Mullers, B&P 30's—40's—50's, Simpson #2 Late.

60—Molding Machines, B & P, Champion, Pin Lifts, Champion 12PJSL's, SPO Jolt Squeeze Pin Lifts, Jolt Squeeze Rollovers, Jolt Rollovers, 110's, 113 J's, 213 D's, 413 D's, 508's, Osborn 275J, 276J's, 714's, 721's Portable and Stationary.

International PK16's—Jolt Squeeze Pin Lifts and Hand Rollovers, Type G's Jolt Squeeze Rollovers.

Sand Blast Rooms

2—Sand Slingers, B & P Tractor Type.

Shakeout, Simplicity 4′ x 8′, Simplicity 3 x 5, Tractor Type, for use on tractor slinger rails, Stoney Bail Shakeouts.

Shaper, G & E, 20″ V Ram

Tablast 8′ Dia. Table, 30″ rotating tables.

Tumbling Barrels, 3 Sly 42 x 48, 1—36 x 48, 1—40″ x 66″. All with geared head motor drives.

Wheelabrator, 48 x 48, American 450, 42″ x 48″ with bucket loader.

Yard Crane, Clam shell, 45″ magnets.

Pattern Shop Equipment, arbor presses, benches, vises, band saws, job clocks, time clocks, drill presses, electric fans, jointer, planer, layout table, 30 x 60, Lockers all sizes, mud mills, Roover Embosser, Rotoclones and Dust Collectors, safes, office equipment, files, typewriters, comptometers, desk chairs, tables, cafeteria equipment, saws, wood and metal, scales, hand trucks, shop trucks, casting boxes, skids.

ACME EQUIPMENT CO., INC.

126-128 S. Clinton St. **Phone: Andover 3-3430** **Chicago 6, Illinois**

FOR SALE

SEE . . . THE LARGEST STOCK OF FOUNDRY EQUIPMENT IN THE MIDWEST.

AIR COMPRESSORS

1—150 H.P. 870 CFM Ingersoll-Rand two-stage air compressor, 220V, 3 ph, 60 cy. with air receiving tank.
1—40 H.P. 200 CFM Pennsylvania single stage air compressor, 220/440/3/60 with air receiving tank.

AIR HOISTS

2—Ingersoll-Rand 6000 lbs. cap., installed on 4'6" x 8' frame with trolley and air motor for horizontal travel.
2—Ingersoll-Rand, 4000 lbs. capacity.
1—Ingersoll-Rand, 2000 lbs. capacity.
1—"Little Giant" LG12.
12—Pendant Air Hoists.
1—Thor, 6000 lbs. capacity.

CONVEYORS

Roller Conveyor—Mathews—8", 10", 14", 30"-36" above rail.
1—Link-Belt Roller Type Power Mold Conveyor, 27'0" x 70'6" centers, 35 cars 38" x 72", to operate in a rectangular path at speed of approximately 45 ft. per minute, complete with structural steel supporting frame work, necessary take-ups, idler corners and driving mechanism with speed reducer, motor and controls.
1—Pigmold Conveyor, 64' sprocket centers, Link-Belt, complete with drive 220/440/-3/60.

CORE BLOWERS

DEMMLER
1—#1—weight of core up to 10 lbs.
1—#2K—weight of core up to 25 lbs.
1—#3E—weight of core up to 35 lbs.
1—S8-4 International.
1—CB-18 Champion.

OSBORN
10—#92—weight of core up to 35 lbs.
1—#194-1—weight of core up to 100 lbs.

REDFORD
2—Bench Cartridge Type for small cores.

CORE-OVENS

1—2 Door Coleman, two rack type, gas and oil firing combination recirculating. All controls. Overall 14'10" x 15'8".
1—2 Door Despatch, recirculating, gas and oil fired. Doors 6'8" x 6'8". 16'0" x 16'0" overall. All controls.

CRANES

1—3 ton—3 motor Bedford bridge crane, 40' span, double built-up steel bridge with catwalk man cab, drum controls, roller collectors, 30 H.P. hoist motor, 10 H.P. travel motor, 3 H.P. Trolley motor, 220/440/3/60.
1—30' hand traveling bridge crane.
3—12' hand traveling bridge crane.
1—20' hand traveling bridge crane.
6—Louden Monorail systems.
2—3 ton Shepard Cupola charging cranes, DC 550V., cab operated, complete with monorail.

FURNACES AND BLOWERS

FURNACES:
STROMAN
2—220/225 NP hydraulic tilt, with blowers.
1—#14 Non-tilt.
CAMPBELL-HAUSFELD
1—#40 Crucible Non-tilt.

HEAT TREATING:
LINDBERG
2—48" x 60" 1400° 90 KW 230V. w/5 H.P. Blower.
G. E.
1—30" x 42" 1800° 37 KW 220V. 1 ph. 168 Amps.

FURNACE BLOWERS:
2—3 H.P. 220/440/3/60, 300 CMF 16 oz. pressure.
1—2 H.P. 220/440/3/60, 260 CMF 16 oz. pressure.

CUPOLA BLOWERS:
1—Spencer Turbine, 50 H.P., 220/440/3/60, 6450 CFM, 16 oz. pressure.
1—North American, 20 H.P., 220/440/3/60, 1950 CFM, 24 oz. pressure.
1—Piqua Size 5½, with 30 H.P. 220/3/60 motor.

EXHAUSTERS:
1—Sturtevant Silentvane, Size 75, 5 H.P. 220/440/3/60.
1—Ingersoll-Rand, 2075 CFM, 15 H.P., 220/440/3/60.
4—110V. fans, 24" dia.

GRINDING EQUIPMENT

2—Fin Cleaning Machines for cylinder heads—Ireland.
1—#230 Gardner double end disc grinder, 30" wheels, V-belt driven.
1—#6 Cheesly disc grinder dir. connected 18" wheel.
1—3 H.P. double end grinder, flat belt driven 220/440/3/60.
1—10 H.P. Black & Decker direct drive double end grinder, 20" x 3" wheels, 220/440/3/60.
2—7½ H.P. #76 Safety Emery Wheel Co. dir. conn. double end grinders, 18" x 3" wheels, 220/3/60.
2—5 H.P. Safety Emery Wheel Co. belt driven double end grinders 18" x 3" wheel, 220V. 3/60.
1—7½ H.P. Universal Swing Grinder, 220/440/3/60.
2—#24 Gardner Disc Grinder, 54" dia., 20 H.P., 220/440/60.

LADLES

WHITING AND MODERN
24" and 27" diameter, 1500 to 2000 lbs. cap. Fully enclosed gear box for hand tilting.

MOLDING MACHINES

JOLT ROLLOVER AND PATTERN DRAW:
DAVENPORT
2—SA-28, 1500 lbs. jolt, 12" draw, 30" x 40" table, 1 w/air clamps.
1—SA-34, 2500 lbs. jolt, 15" draw, 34" x 48" table.
HERMAN
2—Pit-type, 6000 lbs. jolt, 42" x 60" table.
1—Pit-type, 9400 lbs. jolt, 40" x 84" table.
1—Pit-type, 10,000 lbs. jolt, 72" x 12'0" table.
OSBORN
2—Model 405-95, 3500 lbs. jolt, 26" draw, 40" x 60" table.
7—Model 601, 900 lbs. jolt, 10" draw, 24" x 30" flask max.
11—Model 2047, 8" draw, 21¼" x 22¼" core box.
TABOR
2—22" x 32" Table, 600 lbs. jolt, 10" draw, with air clamps.

JOLT SQUEEZE PIN LIFT:
INTERNATIONAL
1—LJSK Hand Lever Lift, 18" x 24" Table, 12" squeeze cyl.
MILWAUKEE
2—196 Roll-on, Roll-off, 3000# jolt, 19" squeeze cyl., 20" x 30" table, 10" draw.
OSBORN
2—S14-P Stationary, 8" draw, 700# jolt. 14"

JOLT SQUEEZER:
CHAMPION
JOHNSTON & JENNINGS
INTERNATIONAL
MODERN
OSBORN—275-J, 210-PJ
SPO—110J, 210-PJ
TABOR

JOLT STRIPPER:
DAVENPORT
1—34AJS, 2500# jolt, 12" draw, 36" x 46" table.
INTERNATIONAL
1—JFL, Foot Lever Lift, 3" draw, 600# jolt.
OSBORN
1—3' x 16' table for long jobs.

ROCKOVER AND DRAW:
INTERNATIONAL
3—"R" hand ram, hand rollover.
MODERN
2—Air jolt, hand rollover.
OSBORN
1—147-1, 20" x 60" core box max.
1—146, 24" x 32" core box max.

SCALES

1—Car scale for cupola charges—Atlas Car & Mfg. Co.
1—6500 lbs. Toledo Floor Scale—Dial, 5' x 7' platform.

SAND SLINGERS

2—16" head Beardsley-Piper Stationary, 1200 RPM, 10 H.P., 220/440/3/60.

SHAKE-OUTS

ROBBINS
1—4' x 6', 8000 lbs. capacity, "Floatex".
1—4' x 10', 12,000 lbs. capacity with 7½ H.P., 220/440/3/60 motor.
SIMPLICITY
1—4' x 6' Model D, 16,000 lbs. capacity, 10 H.P., 220/440/3/60.

SAND MULLERS

SIMPSON
1—#2 Model H, Style E, 14 cu. ft. per batch, 6' dia. pan.
1—#3 Model H, Style E, 30 cu. ft. per batch, 8' dia. pan.
BEARDSLEY-PIPER
2—#70, 29 to 58 tons per hr., 18 cu. ft. per batch.
LINK-BELT
1—Paddle type, 20" x 72".
1—Pugmill, 42" x 96".

SAND PREPARATORS

2—American Sand Cutters, Type AA, 4'8" and 5'2".
1—Link-Belt Aerator with drive, complete.
4—Royer Sand Conditioners, NB-4, C-2, D-23.

SAND BLAST, TUMBLING AND DUST COLLECTING

1—Ruemelin air blast cleaning cabinet.
8—Cleaning cabinets for magnesium castings w/exhausters.
1—Wet Dust Collecting System, Uniwash Recirculating water type, Newcomb-Detroit, 5000 CFM complete.
1—Size 55 American Dustube collector, Type KD, 9'6" x 10'6" x 8'6", 1175 sq. ft. cloth area, 3300 CFM complete.

MISCELLANEOUS FOUNDRY EQUIPMENT

4—20" Combs Gyratory Sand Riddles—Electric.
1—Lot of steel flasks—ask for list.
1—#3½ Modern Cupola.
6—Chain hoists, ½ ton, 1 ton, 2 ton.
1—Link-Belt Core Breaker Drum, 6' x 10'.
1—Revolving Core Conveyor Table.
2—#3 Jeffrey Electric Vibrators.
4—#4 Jeffrey Electric Vibrators.
2—1000 GPM Centrifugal Pumps, Ingersoll-Rand, 52' head, 5" suction, 4" discharge, dir. conn. to 30 H.P. motor 220/440/3/60.
1—Impregnating Installation, fully equipped.

WE BUY AND SELL ONE PIECE OF EQUIPMENT OR COMPLETE FOUNDRIES.

OUR GUARANTEE:

If you are not satisfied with our equipment, you may return it for a full refund.

THE EUCLID FOUNDRY & MACHINE EQUIPMENT CO.

14919 Saranac Rd. **Cleveland 10, Ohio**

TELEPHONE: Glenville 1-1222
Glenville 1-1538

FIRST OFFERING: WE HAVE JUST PURCHASED FROM CANADA'S LARGEST FOUNDRY 5 SIMPSON #3 SAND MULLERS, SEPARATE DRIVE TYPE, STYLE C, SERIAL NUMBER IN 58,000's, COMPLETE WITH SPEED REDUCERS AND MOTORS. THEIR CAPACITY IS 3,000 LBS. AND HAVE AN 8' PAN DIAMETER. THESE UNITS WERE ALL PURCHASED NEW IN 1945 AND ARE IN EXCELLENT CONDITION. OFFERED AT TREMENDOUS SAVINGS FOR IMMEDIATE DELIVERY.

MOLDING MACHINES

13—**S P O** No. 110J Portable Jolt Squeeze Machines, 1952 machines. Used 3 months.
2—**S P O** No. 506 Jolt Rollover Pattern Draw, 600 lbs. Cap., 10" Draw, 24" x 25" Table.
6—**OSBORN** No. 275J. Jolt Squeeze Machines, portable and stationary models.
6—**OSBORN** #212 PJ Jolt Squeezers 17" x 26" Table, 12" squeeze cylinder.
3—**OSBORN** No. 559 HD Jolt Strippers, stationary, Table 25" x 30", Jolt 1200 lbs.
1—**OSBORN** #405-79 Jolt Rollover Pattern Draw Molding Machine 40" x 72" Table Size, Capacity 3500 lbs.
3—**OSBORN** Model 601, Jolt, Rollover, Pattern Draw, 600 lbs. cap. Flask 30".
1—**OSBORN** No. 333 H Jolt, Squeeze, Power Rollover, Pattern Draw, 2000 lbs., Jolt, 22" x 44" Table Jolt Cyl. 12". Draw 22".
2—**OSBORN** No. 142 Jolt, Rollover, Foot Draw, 14½" x 24" Table Draw 8", 350 lbs. capacity.
1—**JOHNSTON & JENNINGS** #401-C, Portable Jolt Squeezer.
1—**JOHNSTON & JENNINGS** #681-C, Portable Jolt Stripper, 24" x 30" Table.
1—**JOHNSTON & JENNINGS** Model 1216S Stationary Jolt Pin Lift, table size 36" x 54". Draw 16". Capacity 3000 lbs.
1—**TABOR** Jolt Rollover and Pattern Draw, Draw 10", 600 lbs. Capacity, 22" x 42" Table, Shakeless Jar Portable.
2—**TABOR** 30 x 40 Jolt Rollover and Pattern Draw Machines, 1000 lbs. cap., 12" draw.
1—**TABOR** 40 x 50 Jolt Rollover and Pattern Draw Machine, 1500-3000 lbs. cap. 15" draw.
1—**INTERNATIONAL** Model PKL, Jolt Squeeze, Air Pin Lift Machines, 18" x 24" Table, Lift 5½", Squeeze Cyl., 12".
1—**INTERNATIONAL** Model MJ, 16" x 4" Draw, Power Jolt Hand Rollover.
5—**INTERNATIONAL** Type "R" Hand Ram, Hand Turnover, Foot Draw.
2—**INTERNATIONAL** Type "HJ" Jolt Ram, Hand Turnover, Foot or Hand Lever Draw Machines. Various sizes.
2—**INTERNATIONAL** Type RES, Size 15" x 8", Jolt Squeeze, Rollover, Draw Machines. Table size 18" x 34".
4—**INTERNATIONAL** Type G, Air Jolt, Air Turnover Foot Draw Machines, Sizes 20" x 8"—24" x 8"—30" x 8"—24" x 10".
2—**CHAMPION** JS-10-P, Jolt Squeezer, Portable, Serial No. 5770, Table size 18" x 26". One like new, still crated. 2—Heads.
1—**CHAMPION** Model No. JM 16, Serial No. 5092, Power Jolt, Hand Turnover, Foot Draw Machine, 12" x 17" table.
1—**DAVENPORT** Model 28, Aro Jolt Rollover, and Pattern Draw, 1500 lb. Jolt Capacity, 12" Draw, 30" x 40" table.

MULLERS

2—**BEARDSLEY & PIPER** #3½ Mulbaros.
1—**BEARDSLEY & PIPER** No. 60 Speed Mullers, 10 cu. ft. w/motor and drive.
1—**CLEARFIELD** #404 Late Type. Sand Muller. Motor 220 V.
1—**SIMPSON** No. 0 Sand Muller, 175 lbs. batch size with motor and drive.
1—**SIMPSON** No. 1 H Sand Muller, unit drive, 500 lbs. batch, complete with skip hoist. Late machine, serial No. 60018.

SAND PREPARATORS

4—**BEARDSLEY & PIPER Model "S"** Screenerator, Pneumatic Tires.
4—**BEARDSLEY & PIPER** Model "M" Screenerator, on pneumatic tires.
1—**BEARDSLEY & PIPER** Sand Conditioner, complete with magnetic separator, 10 H.P. totally enclosed motor, overhead hopper, 90 cubic ft. & aerator. Serial Number SC-73, 1946 machine.
1—**ROYER** Model NB-2 Sand Conditioner, portable, 7 to 9½ tons. Rubber tires.
1—**ROYER** Model C-2 Sand Conditioner, portable, 25 to 30 tons per hour.
1—**JEFFREY** Type "P" Sand Conditioner, Class B Mixer, Portable, Serial No. 377.
1—**AMERICAN** Sand Cutter, Model AM, Size 69 x 45.
1—**AMERICAN** Sand Cutter Model 79 x 60.
1—**ROYER** Shakeout and portable sand conditioning unit.
1—**ROYER** Model NC-4 Sand Conditioner, portable, 12 to 15 tons, rubber tires.

CORE OVENS

1—**COLEMAN** Core Oven, gas fired, 2 doors, 6' high, 5' wide, 4' deep. W/burners.
2—**DISPATCH,** Gas Fired, Drawer Type Core Ovens. Drawers 46" wide, 59" deep, 9" high. Complete with Rail Supports and Controls. These machines are in excellent condition and were new in 1944.

CORE BLOWERS

1—**OSBORN** No. 91, Serial No. 10050.
2—**OSBORN** No. 92 Core Blowers, Serial No. 9703A and 8692-C. Air Clamps.
1—**DEMMLER,** No. 1-E Core Blower, Serial No. 3287. Air Clamps, 1950 unit.
1—**DEMMLER** No. 2 with Air Clamps.
2—**REDFORD** No. 1, Cartridge Bench Type.

GRINDING EQUIPMENT

1—**FOX** Stand Grinder #5, single wheel, size 24" x 2", 10 H.P. 220/440 V.
1—**HAMMOND** Model WR-1 Double End Snagging Grinder, 7½ H.P., 220/440/3/60.
2—**HAMMOND** Model WH-10 Double End Grinders with (2) 7½ H.P. 220/440 3 phase, 60 cycle, wheel size 20" x 2" x 2".
2—**U. S. ELECTRIC** Double End Snag Grinders, 20" Wheel, 5 H P Motor.
6—**U. S. ELECTRIC** Model 69, adjustable speed snagging grinders, 4 speed changes, 30 H.P. Motor.
6—**MARSCHKE** Swing Frame Grinders, 20 H.P. and 25 H.P. models.
1—**QUEEN CITY** Model 100 Double End Disc Grinder with 10 H.P. 220/440 Volt Motor size 20" x 2" x 2", Very Late.
1—3 H P Double End Grinder.
1—Safety Portable Model 204 Swing Grinder 24" x 3", 15 H.P. Motor.

SAND BLASTING EQUIPMENT

1—**AMERICAN WHEELABRATOR** Tumblast, 36 x 42, with Skip Hoist & Shot Return. Serial No. A-37913.
1—**AMERICAN WHEELABRATOR** Multi-Table Blast Machine, 8-27" Tables, with Shot Return and Dust Collector. Serial No. A-44791, Model BM 66900.
1—**PANGBORN** Room Blast 10' x 12' x 12', complete with Tank, Elevator, Dust Collector and Safety Equipment.
1—**NEW HAVEN** Air Blast Barrel 48" x 42", with Motor and Drive, 1942 unit.
1—**WHITING** Tumbling Barrel 30" x 60", plate 1", complete with 5 HP gear head motor, drive, and starter. 1952 unit.
4—Tumbling Barrels, 36" x 72". 1¼" plate.

MELTING FURNACES

5—**FISCHER,** #400 Crucible, type BBI mechanical tilting, with motors, blowers, new crucible, and bricking, gas or oil fired. New in 1949.
3—**FISCHER** Model MNP Tilting Furnaces, size 2400, complete with New Pot, blowers, and electrical tilting mechanism.
2—**FISCHER** #225 Crucible, type BBI, mechanical tilting, w/motors, blowers, etc., gas or oil fired.
1—**FISCHER** #125 Crucible, type BBI, mechanical tilting, w/motor blower, gas or oil fired.
6—**BELLVIEW** Tilting Furnaces 550 lbs. capacity, with pots. 2-H.P. motor and blower. Gas or oil burners.
1—**REDA** 550 lb. Hydraulic Tilt, Gas or Oil Fired. 1952 Unit.
1—**STROMAN** #600, Model "U" Tilting Furnace, 3 H.P. motor and blower, gas fired, with extra shell. New in 1949.
1—**YORK WALKER** #28 Tilt Furnace, 300-400 Crucible, complete with new bricking, motor and blower.
4—500 lbs. capacity Holding Furnaces, newly bricked, w/burners, motors and blowers.
3—Stationary Pit Type Furnaces, #125 Crucible. W/burners, motors, blowers.

MODERN POURING DEVICES

6—**MODERN** Pouring Device, Model "F", With 17" Taper Covered Ladles, 500 lbs. capacity, and Hand Tilting Devices.

WHITING POURING LADLES

1-2-4-5-8½-10 ton capacity, all nose tilting, totally enclosed gearing.

HEAT TREAT FURNACES

1—**YOUNG** (3) Compartment Pull Drawer Oven, for Magnesium, each compartment 6'6" wide x 5'9" deep x 7' high inside (3) Drawers to each compartment. Electric heating for temperature of 800°. For Heat Treating, Drawing, Stress Relieve.

CONVEYORS—Apron - Roller - Belt

1—**JEFFREY** 24" wide 10'3" centers, Trough Conveyor, with Stearns Magnetic Pulley, Motor and Reducer.
1—**GODFREY** 18" x 19' Under Car Unloader, with 3 H.P. Motor. Steel Belt.
1—18" x 24' Apron Conveyor, Steel Link Belt, complete with motor and drive.
1—24" x 20' Apron Conveyor, Steel Link Belt.—Less motor and drive.
500'—**MATHEWS** Roller Conveyor, Above Rail 20" wide, 2½" Rollers, on 4" Centers.
300'—**MATHEWS** Roller Conveyor, Above Rail 24" wide, 2¾" Rollers, 4" Centers.
60'—Roller Conveyor 14" wide, 2" Rollers, above rail, 6" centers.

BUCKET ELEVATOR

1—**NEWAYGO** Model HS-7-GT **"HANDY SANDY"** Twin Hopper Type with Conveyor and Vibrators, 1950 unit.
1—**JEFFREY,** 106' Belt 13" wide, 50' center to center of Drive Pulleys, 106—12" x 8" x 11¾" continuous type buckets, with Jones Reducer.

AIR HOISTS—ELECTRIC HOISTS

2—**INGERSOLL RAND,** Size D, 4000 lbs.
1—**INGERSOLL RAND,** Size B 1000 lbs.
1—**LITTLE GIANT,** Model A, 1000# cap.
1—**THOR PNEUMATIC,** 1000 lbs. capacity.
1—**SHEPPARD** 5-Ton D.C. Hoist, 6 H.P. Motor, 230 V.
1—Electro-Lift, 3000 lbs cap. 220/440 low head room cable hoist.

SHAKEOUTS

1—**SIMPLICITY** Shakeouts, 3' x 3', Serial #33—SOS—106, Model S, 1000# cap.
1—**SIMPLICITY** Shakeout, 5' x 7' Serial #57—SOBG—185, Model BG, 5000 lbs.
1—**SIMPLICITY** Shakeout, 4' x 6', Serial No. 46—SOB—145, Model B.
2—**SIMPLICITY** Shakeouts, 4' x 8', Serial No. 48—SODE 104, Model DE, 16,000 lbs. capacity.

BLOWERS

1—**BUFFALO FORGE** No. 7-E Blower, 25 H.P., 3600 rpm, 220/440 volts, 28" wheel, 32 oz., 1600 cfm.
5—Assorted Blowers for Furnaces, 2-3-5-7½ H.P., 16 oz.

SAND SLINGER

1—**B & P,** model DB, stationary type, 16" head, 4" tip, first arm 10'3", 4' ramming unit. Motor-dual, 10-15 HP, 220-440 V. 60 cy.
1—**B & P** Tractor Type Sand Slinger with Magnetic Tower, 13' arm, 16" head, 4' ramming unit, 4" tip. 1951 machine.

MISCELLANEOUS

1—**INGERSOLL RAND** Air Winch, Size MHO.
1—**SCHMEIG** Spark Arrestor.
1—**LINK-BELT** Car Puller.
1—**PANGBORN** Exhauster No. KW2.
1—**PANGBORN** Exhauster No. 10KX.
1—**PANGBORN** Exhauster Size #7.
1—**PANGBORN** Exhauster Size C.
1—**ELECTRO-MAGNETIC** Pulley 24" x 24".
3—Electric Riddles, 21" diameter, ⅓ H.P. Motor, 110 volts.
1—**CLIMAX** Wire Straightener No. 2A.
2—**SYNTRON** Vibra Flow Feeds, Type F 210, Style 1538.
3—**LEEDS & NORTHRUP** Model "S" Micromax.
1—Cupola Lighter, Tank and Torch.
1—**HOWE,** Weightograph 6000 lbs. capacity 4' x 5' Platform.

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Electric Melting Furnaces

LECTROMELT 500# Type T, Side Charge. G.E. circuit breaker. Moore controls and pittsburgh 300-375 KVA 2300 volt primary transformer.

DETROIT ELECTRIC, 1500# capacity, 13,200 primary voltage. Kuhlman transformers. Complete with controls.

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DETROIT ELECTRIC 350#, Type LFA with Kuhlman transformers and oil circuit breaker.

DETROIT ELECTRIC with 350# and 1000# tapered shells, 2300 V Kuhlman Transformer. Complete with panelboard and bus bars.

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FOR SALE

AIR COMPRESSORS

Ingersoll Rand Type 10—14 x 9 x 12, 2 stage, 75 HP, 3/60/220/1200 rpm synchronous motor, 350 CFM at 100#.
5 x 5 Ingersoll Rand 10 HP motor.

BLOWERS

Spencer Turbo Blower, 2250 CFM at 16 oz. 15 HP 3/60/220 totally enclosed motor. New 1947.
Ingersoll Rand Motor Blower Type FS. Single Stage 4000 CFM @ 3.75 PSI, 100 HP, 220 V. G.E. Induction Motor.
Buffalo 7E Direct Connected Blower, 50 HP Westinghouse motor, 3/60/220-440 V, 3535 rpm, 28" wheel, 3500-4000 CFM at 32 oz. Flanged onutlet.
Spencer Turbo Blower. New 1949. 3500 cfm, 28 oz. with 40 HP 220-440 motor and Foxboro controls.

CONVERTER

100 KW Rotary Westinghouse 220 V 60 cycle primary 250 V DC, complete with controller and panel.

CORE BLOWER

International SB13. Unused, still on original skids.

CORE OVENS

3—Section Foundry Equipment Co. Gas fired, 5 drawers per section.
4—Section Foundry Equipment Co. Gas fired, 5 drawers per section.

CORE ROD STRAIGHTENERS

1—American Core Rod Straightener.

CRANES

5 Ton P & H Overhead Elec. Traveling Crane, 30'6" span, 15' lift (can be increased) 3 motor, 220 V A.C. New 1946.
10 Ton Northern Overhead Elec. Traveling Crane, double girder, fish belly, 3 motors, 230 V D.C., 54'7½" wide C to C of wheels can be cut down to fit smaller size.

CRUSHERS—PULVERIZERS

2—Stedman 15" x 12" Type A. One with 10 HP 220-440 V motor. One without motor.

FIRE EXTINGUISHERS

St. Regis Model 181 Dry Powder for magnesium fires.
Buffalo 50 gal. soda-acid cart type.

FORK LIFTS

Baker 6000# Gasoline Fork Lift Trucks, KMH60, 120" lift, 88" collapsed height, 42" forks, solid tires. Rebuilt-Guaranteed.
Ross Fork Lift Truck, 19 HT, high lift, 6000# capacity, 14' lift, 48" forks. Pneumatic tires. Rebuilt-Guaranteed.

GRINDERS, DISC

Besley 208 Double End 26" x 2⅜" wheel with 2 compound tables, V belt drive, 15 HP, 220-440 totally enclosed motor, magnetic starter controls.
2—U. S. Model 80 Double End 2-18" dia. wheels, 7½ HP motor, 2 swinging tables 8" x 14"—1 with hand lever feed.
Besly #372, 53" diameter wheel, 25 HP spindle motor.

GRINDERS, SNAGGING

McCabe 2" x 24" wheels, 48" between wheels, 3/60/440 V.
Ranson 8B Double End 2" x 20" wheels, 220 V motor, p/b control.
1—Hammond type 20 WR2—3" x 24" wheel, double end grinder, single speed, 20 HP Louis Allis Squirrel Cage, 220-440 V—1760 rpm motor.
2—Norton Type D, 3" x 24" wheel, 66" between centers, flat belt drive.
1—U. S. DE, 7½ HP adjustable speed.
2—U. S. DE, 20 HP adjustable speed.
1—U. S. DE, Model 65, 3" x 24" wheels, variable speed, 20 HP motor.
2—U. S. Model 64 Snag Grinders 3 x 24" wheels. Late.
2—U. S. Model 65 Snag Grinders 3 x 24" wheels. Late.
1—Fox #5 Single Wheel Snag Grinder.

GRINDERS, SWING

2—Fox 10 HP 3/60/220-440 V, Swing Frame.
U. S. 15 HP, 3/60/440 V Swing Frame, 2 speed.
Fox 15 HP Swing Frame, 2 speed.
Marschke 20 HP, 2 speed.

HOISTS

500# American LoHed.
1000# Cleveland 220/440 V.
1000# Detroit 220/440 V.
5—1000# P & H Hevi Duty with trolley.
2—2000# P & H Hevi Duty with trolley.
2000# Detroit Electric.
2000# American LoHed.
11—4000# P & H Hevi Duty with trolley.
2—4000# P & H Hevi Duty with trolley and powered drive unit for moving hot metal.
2—5 Ton Air Hoists with motor driven trolleys.

LADLES

1 Ton Enclosed Gear Crane Ladle truck type 4 wheel car for 18" gage track, Whiting Junior.
1—20½" Top Whiting Enclosed Gear Ladle.
3—1500# Modern Cylindrical covered ladles, 28" dia.
2—Whiting 40" x 40" enclosed gear outside teapot spout ladles.
1—Whiting 44" x 44" Bottom Pour Ladle, 8000# in steel.

MOLDING MACHINES

2—Champion Pin Lift Pushoffs, 46" x 46" x 12" draw.
1—Champion Hand ram, hand clamp, hand rollovers 26" x 14" table.
1—Champion Hand Ram, Hand rollover, Hand draw core machines, 15 x 15 bed.
3—Davenport Portable Jolt Rollover Pattern Draw 20" x 24" tables, open end, 8" draw.
1—International Type G 24 x 10 Jolt Rollover, foot draw, 22 x 30 table, 10" draw.
1—Herman Molding Machine Jolt Rollover Pattern Draw, 20 x 30.
1—Herman Molding Machine Jolt Rollover Pattern Draw, 20 x 36.
1—International Type G 30 x 12 Jolt Rollover Foot Draw, 28" x 36" table, 12" draw.
1—International Type G 30" x 30" table, 9" draw. Portable.
2—International Type G 18" x 56" table, 8" draw. Portable.
1—International Type F Jolt Rollover 27 x 12, 12" draw, 35" x 26" table.
1—International Jolt Rollover Pattern 10" Draw, 22" x 30" plate, 6" jolt cylinder.
1—International Plain Jolt Molding Machine 48" x 60" table, no pit required.
1—Herman Jolt Rollover Pattern draw, 40" x 84" table, slotted nickel alloy table over regular table to accommodate various sized flasks, air clamp, new 1946. Used very little.
1—Herman 20" x 30" rollover pattern draw, 750# series. Air clamp.
2—Herman 20" x 24" Jolt Rollover Pattern Draw, 750# series. Air clamp.
1—Herman 4000# Series High Speed Rollover 30" x 60" with 32" x 48" bumper, 13" cylinder pattern device.
2—Milwaukee Arm Type Jolt Squeeze Strippers, 1500# capacity, Model 163-50 Serial 13104-5, 15" x 24" table, 16" x open end, pattern size. Late type.
1—Osborn 76J Portable Jolt Squeeze Molding Machine 12" cylinder.
3—Osborn Jolt Squeeze Molding Machines, 275J, 16 x 20 table, tilt back head.
2—Osborn 405 Jolt Rollover 40" x 70", 2000# capacity, 20" x 60" jolt table and 4 wheel receiving car.
1—Osborn Portable Jolt Rollover Pattern draw, 900# capacity. Model 601-13. 30" x 24" flask size. 10" draw.
1—Tabor 1000# Rollover, 30" x 60" table.

MULLERS AND MIXERS

1—Simpson #1 Style K Muller with Bucket Loader, 4 cu. ft. size.
Simpson #2 Motor on base, bucket loader.
Simpson #3 Motor on base, bucket loader.
Simpson #3 Type H open gear type.
Simpson #3 Open Gear Type, $1000.00.
American Model M Sand Cutter, 70" blades.
Kwick Mix Paddle Type.
Royer NDP 47 14" Belt, 4 rubber tires.

PREPARATOR

B & P #70 Preparator. Only used 3 months.

ROTOBLAST

Pangborn, table with 3-8" rotating work tables, 3 position loading, cleaning and touch-up designed for work similar in size to aircraft cylinders. Like New condition.

SHAKEOUTS

1—3' x 5' Link Belt.
2—4' x 6' Simplicity.

SPEED REDUCERS

Cleveland 408-R1, 36 to 1, 20.5 HP.
Falk Motoreducers 7½ HP.
U. S. Syncrogear Motors 7½ HP.
U. S. Syncrogear Motors 5 HP.

TUMBLING BARRELS

Whiting 30" x 48".

WIRE STRAIGHTENERS

2—Climax 1 HP motor.

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WE WILL BUY FOR CASH A SINGLE PIECE OF EQUIPMENT OR YOUR ENTIRE FOUNDRY

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Cleaning Room: 42″ x 48″ Model 450 American Wheelabrator; Sly Tumbling Barrel 36″ x 99″; Sly Blast Room, 72″ x 72″ Door.

Core Room: Type D American Pneumatic Core Straightener; Gas Fired Mahr Circulating Core Oven, 84″ Wide x 11′ Deep; Style 1 Demmler Core Blower; Wadsworth Stock Core Machine; Size 1, Style C Simpson Muller.

B & P Stationary Sand Slinger
With 25 HP AC Motor, Model S-421

B & P No. 80 Speed Muller, No. 80-140
With 125 HP AC Motor, Air Operated Gates,
15 HP Cooling Fan, Mixing Hopper.

Molding Machines: 4—Spo No. 2160 And 2114P Jolt Squeeze Strip; Johnson & Jennings And International Jolt Rollovers; Milwaukee And International Portable Jolt Squeeze; International Type RJ Core Rollover.

Also: Champion Pin Pushoffs; Belt Conveyor Feeders; Hoppers; 4 x 6 Simplicity 15,000 Lb. Shakeout; Trough Conveyors; Bucket Elevators; Syntron Vibrating Feeder Tanks; 66″ Whiting Cupola; 5—Crane Ladles 1000 Lb. To 12,000 Lb.; 500 Lb. Modern Pouring Devices; Hoists; Foundry Truck; Scales; Crawler Crane; Fork Lifts;

75 Tons Cast And Formed Steel Flasks, i.e. Sterling, Hines Popoffs

And Heavy Duty Boring Mills, Planers, Lathes, Drills, Milling Machines, Grinders, Keyseaters, Gear Equipment, Etc., Etc., Etc.

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OVER A MILLION IN USE . . .

The Hamilton Spray Gun

$15
1/8" and 1/4" pipe size
F.O.B. Hamilton, Ohio

For spraying molds and cores with liquids, for cleaning motors and machinery, for laying dust, spraying hot roofing material, and for many other uses. Instant trigger control. Unit shipped complete with 4½ ft. length of suction hose and sinker. Guaranteed.

A squeeze of the trigger and the Murphy Pistol Sprayer instantly shoots a stream of blackening into inner pockets that could never be reached by old-fashioned brush or swab method. Designed by a foundryman, the Murphy Pistol Sprayer is ideal for cleaning permanent molds—aluminum and other metal, and for sand blasting.

Pipe size	1/16"	1/8"	1/4"	3/8"	1/2"
Price F.O.B. Hamilton, O.	$15.00	$15.00	$15.00	$17.50	$22.00

Prices complete with 5 ft. suction hose

EXTRA LONG NOZZLES FOR 3/8" SIZE

This size Sprayer can be furnished with nozzles up to 48" long for spraying ingot molds and hard to reach places . . . also available with curved nozzles up to 15" long.

Long Nozzle Sprayer $22.00

Write for descriptive literature.

$15
1/16" to 1/4" pipe size
Any length nozzle desired

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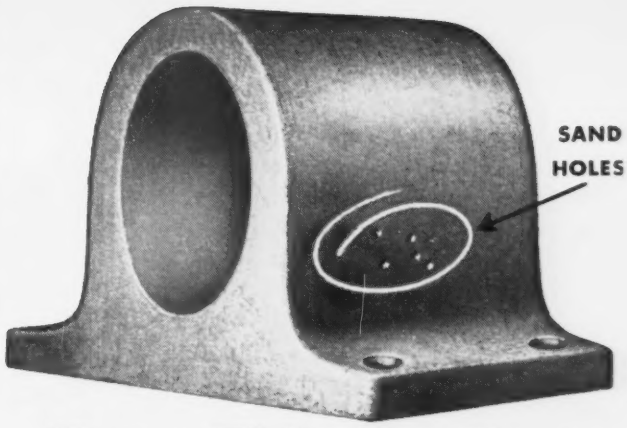

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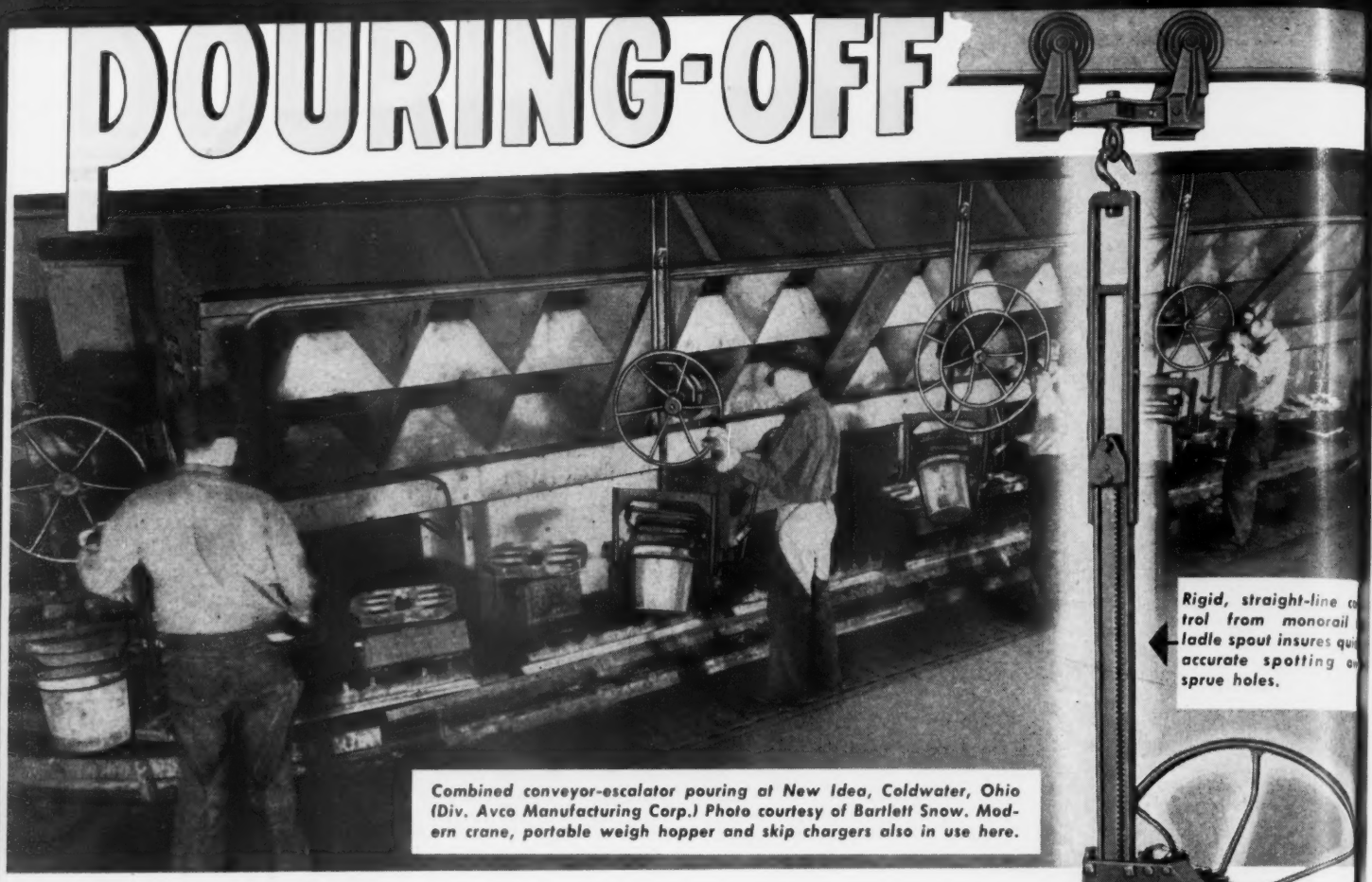

Combined conveyor-escalator pouring at New Idea, Coldwater, Ohio (Div. Avco Manufacturing Corp.) Photo courtesy of Bartlett Snow. Modern crane, portable weigh hopper and skip chargers also in use here.

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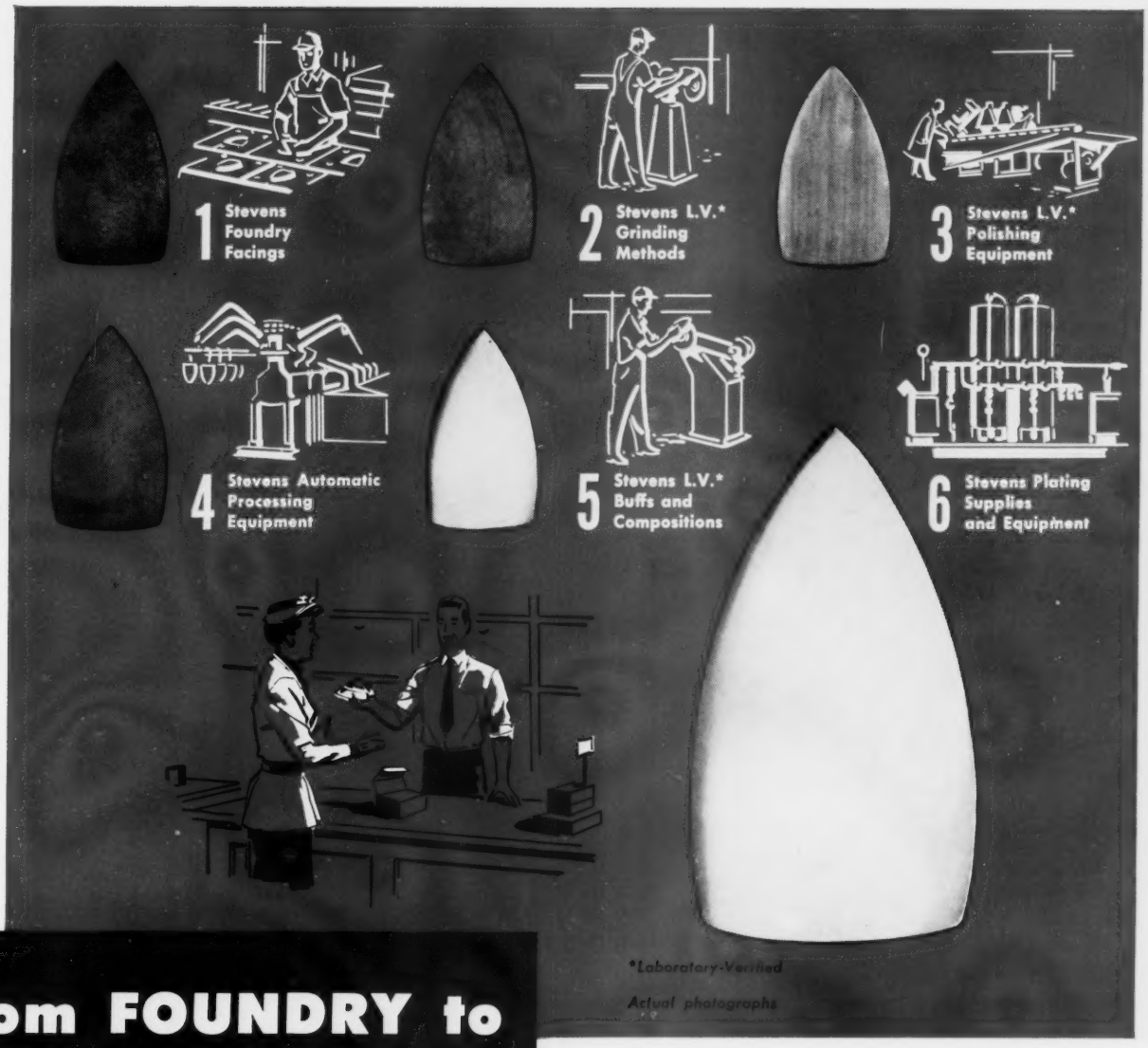
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